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Issued September 9, 1912.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF ANIMAL INDUSTRY.—BULLETIN 149.

A. D. MELVIN, CHIEF OF BUREAU.

THE NORMAL COMPOSITION OF AMERICAN CREAMERY BUTTER,

BY

S. C. THOMPSON, R. H. SHAW, AND R. P. NORTON,
Of the Dairy Division.

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LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
BUREAU OF ANIMAL INDUSTRY,
Washington, D. C., March 27, 1912.

SIR: I have the honor to transmit herewith, and to recommend for publication in the bulletin series of this bureau, a manuscript entitled "The Normal Composition of American Creamery Butter," by Messrs. S. C. Thompson, R. H. Shaw, and R. P. Norton, of the Dairy Division.

The production of creamery butter has reached vast commercial proportions, and different standards are in force in the various States for the regulation of its quality and chemical composition. Much analytical work has already been published on the composition of butter, but most of it is lacking in certain essential details, with the result that little definite information regarding the normal composition of American creamery butter as now manufactured is available. A comprehensive study of the subject was undertaken by the Dairy Division, and this paper records complete analytical details of some 700 samples of creamery butter derived from 14 States. This work was done under the direction of Mr. B. H. Rawl, chief of the Dairy Division.

Respectfully,

A. D. MELVIN,
Chief of Bureau.

Hon. JAMES WILSON,
Secretary of Agriculture.

CONTENTS.

	Page.
Introduction	7
Previous investigations	7
The experimental work	8
Area covered	8
Method of sampling	9
Method of analysis	9
Results of the analyses	10
General averages	10
Averages by States	13
Details of some extreme samples	18
Navy butter	20
Appendix	22
Table I. Detailed analyses of the samples of American creamery butter	22
Table II. Detailed analyses of the samples of Navy butter	31

ILLUSTRATIONS.

Page.

FIG. 1. Diagram showing the fat content of the samples from Iowa, Wisconsin, and Minnesota, and of all the samples in the investigation..... 17

2. Diagram showing the moisture content of the samples from Iowa, Wisconsin, and Minnesota, and of all the samples in the investigation.... 17

3. Diagram showing the salt content of the samples from Iowa, Wisconsin, and Minnesota, and of all the samples in the investigation..... 18

4. Diagram showing the percentage of curd in the samples from Iowa, Wisconsin, and Minnesota, and in all the samples in the investigation.... 19

THE NORMAL COMPOSITION OF AMERICAN CREAMERY BUTTER.

INTRODUCTION.

During recent years the composition of butter, from a quantitative point of view, has been a subject of considerable interest. Reports of thousands of analyses for water and other constituents have appeared in various publications from time to time, but data showing the composition of normal American creamery butter and the conditions under which such butter is made are not plentiful. Hence it has been deemed advisable to make a comprehensive study of the subject.

The purpose of this bulletin is to present in a variety of ways the results of the chemical analyses of American creamery butter collected, during a period of one year, from a large number of representative creameries throughout the principal dairy districts of the United States, and to include a record of the conditions under which the butter was made.

The authors acknowledge the assistance and cooperation of the dairy and food departments of the various States mentioned in this bulletin, all of which rendered valuable aid in securing samples of butter.

PREVIOUS INVESTIGATIONS.

There is no lack of published data on the composition of American creamery butter, but such data represent, very largely, analyses made on miscellaneous samples, the sources of which are more or less obscure and the churning conditions unknown. Nothing would be gained by reviewing the mass of analyses, the great majority of which concern the moisture content alone, or were made in connection with investigations on other subjects. A brief review of some of the principal investigations follow:

The most recent and perhaps the most extended work on the composition of American creamery butter was made by Lee and Barnhart, of the Illinois Experiment Station, in 1909, and published as

Bulletin 139 of that station. They analyzed butter made in several States and purchased on the open market at Chicago, Elgin, and Aurora. Their work extended over a year. The main points in their summary are here quoted:

Average composition of 574 samples of market butter collected for a period of one year, beginning March, 1907, was: Water, 13.54; fat, 83.20; salt, 2.25; and casein and ash, 0.90 per cent.

There was no difference in the composition of butter caused by the season of the year, the State where it was made, of the dealer by whom it was handled.

Average composition of 60 samples of "convention butter" was: Water, 12.54; fat, 84.65; salt, 1.77; and casein and ash, 1.02 per cent.

The Dairy Division published in 1902, as circular 39 of the Bureau of Animal Industry, United States Department of Agriculture, the average water content of 802 samples of creamery butter, from 400 different creameries located in 18 States. The average water content was 11.78 per cent.

C. W. Fryhofer, of the Dairy Division, analyzed butter purchased on the New York market during 1907. This work has hitherto been unpublished, and the results are as indicated in the following table:

Analysis of butter purchased on the New York market in 1907.

Contents.	Samples tested.	Average per cent.
Butterfat	170	82.35
Water	828	13.72
Salt	142	2.15
Curd	109	.88

The Massachusetts Experiment Station Report for 1892 gives the following average analysis of 25 samples of butter: Fat, 83.95; salt, 4.74; curd, 0.66 per cent (water not given).

Iowa Experiment Station Bulletin 80 gives the following average analysis of 224 samples of butter (State educational contest): Fat, 83.91; water, 12.87; salt and ash, 1.98; curd, 1.23 per cent.

THE EXPERIMENTAL WORK.

AREA COVERED.

The area covered in this investigation embraces 14 States, namely, California, Iowa, Kansas, Maine, Michigan, Minnesota, Montana, New York, North Dakota, Oklahoma, Pennsylvania, South Dakota, Texas, and Wisconsin. The samples were taken during a period of one year from 488 creameries, and the total number which reached the laboratory in good condition for analysis was 695.

METHOD OF SAMPLING.

The samples in all cases were collected by Federal and State officials who appreciated the necessity of proper sampling. The following instructions were given each official:

The samples may be taken with a trier or by stripping a tub and cutting a V-shaped wedge from top to bottom of tub. The sample should be large enough to about fill the can. A sharp knife is satisfactory for cutting out the butter, which may be put into the can piece by piece until the can is about full. The cover should be pressed on tight, the can placed in the mailing tube, and mailed to the Dairy Division.

Be sure to note the number on sticker pasted on the can and mark the same number on the detailed report of manufacture. These should be filled out for one day as fully as possible and returned to us. This work may have an important value on the future standard for butterfat in butter, and we request caution in every particular. If the sample of butter is not taken from the tub it may be taken from the churn after the butter is worked and ready to pack. The surface of the butter should be stroked with a ladle to remove free moisture appearing on the surface and then take about 10 samples from different parts of the churn, which put directly into the can. If the sample is to be taken from the print, cut off from one end enough to fill can.

The samples were placed in half-pound friction-top cans, which were inclosed in mailing tubes and sent to Washington. With the exception of a few, which were discarded, the samples were received in good condition.

A number of samples were taken from the creameries making and packing butter for the United States Navy. These are considered separately, since the butter was made under contract specifying the quantity of salt and water permitted.

METHOD OF ANALYSIS.

The samples were mixed by placing them, while still in the cans, either in warm water or on the steam bath and stirring until the mass was of the consistency of thick cream. In this condition—that is, when the butter is not solid and yet not liquid enough to pour—it can be thoroughly mixed. The charges, in duplicate, were taken after mixing in this manner.

The fat, water, and curd [1] were determined according to the official method as described in Bulletin 107 (revised) of the Bureau of Chemistry, United States Department of Agriculture.

The salt was determined by the hitherto unpublished method devised by C. E. Gray, formerly chemist in the Dairy Division, the details of which are as follows:

Volumetric flasks of 250 c. c. capacity are used, which are provided with a second mark representing the volume of 250 c. c. plus the volume occupied by the fat in 5 grams of average butter at about 80° C. Five grams of the butter to be tested are weighed into a small beaker and washed with hot water into the volumetric flask. The flask and contents are then vigorously shaken and hot water added until the upper

[1] The term "curd" as used in this bulletin includes the ash and lactose.

layer is considerably above the second mark. The flask is then allowed to stand until the fat has risen into the neck and the upper layer settled to the upper mark, caused, of course, by contraction on the cooling of the liquid. At this point a 50 c. c. pipette is thrust into the flask and aliquots representing 1 gram quickly removed. The fat is prevented from entering the pipette by holding a finger over its mouth until the point is well below the fat layer. After cooling, the aliquots are titrated in the usual manner with a standard silver nitrate solution, using potassium chromate as indicator.

This method has been found to compare very favorably with the official method in accuracy and has the advantage of being much more rapid.

RESULTS OF THE ANALYSES.

A general table, which contains the original data of all the samples having practically complete churn records, is shown as Table I of the Appendix at the end of this paper. This table gives the samples by number, with the chemical composition and churning record of each. The following 30 tables have been constructed from the original data to facilitate study and show some of the comparisons that may be made.

Tables 1 to 12, inclusive, show averages of all samples in the aggregate. Tables 13 to 24, inclusive, have been compiled to show the average composition of butter from those States where the bulk of the samples originated. Tables 25 to 28, inclusive, give the chemical composition and churning record of those samples showing extremes in the various constituents. Tables 29 and 30 record the analysis of 34 samples of Navy butter.

GENERAL AVERAGES.

The first series of tables, Nos. 1 to 12, show the average composition of all the samples; the average composition by classes, seasons, and size of granules; the temperature of churning and of wash water by seasons; the test of buttermilk by seasons; the relation between the fat and moisture contents; and various phases of the churning conditions.

TABLE 1.—*Average composition of all samples used in the investigation.*

Number of samples.[1]	Fat.	Water.	Salt.	Curd.
695	*Per cent.* 82.41	*Per cent.* 13.90	*Per cent.* 2.51	*Per cent.* 1.18

[1] This includes all samples which reached the laboratory in good condition. The churn records were, however, not complete in all cases. In the tables which follow some of the results were omitted for this reason.

The samples having complete churn records were divided into three classes: (1) Those having 84 per cent of fat and over, (2) those having

less than 81 per cent, and (3) those having 81 to 84 per cent of fat. The average composition of the three classes is given below:

TABLE 2.—*Average composition of the butter by classes.*

Class.	Number of samples.	Fat.	Water.	Salt.	Curd.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
1	124	84.78	12.45	1.78	0.98
2	130	79.77	15.32	3.52	1.37
3	370	82.55	13.85	2.41	1.18
Variation		5.01	2.87	1.74	.39

TABLE 3.—*Average composition of the butter according to seasons in which samples were taken.*

Season.	Fat.	Water.	Salt.	Curd.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
January, February, March	82.46	13.94	2.49	1.10
April, May, June	82.93	13.67	2.42	.96
July, August, September	82.12	14.04	2.58	1.25
October, November, December	82.25	13.81	2.55	1.38
Variation	.81	.34	.16	.42

TABLE 4.—*Average composition of the butter according to size of granules when churning was completed.*

Size of granules.	Number of samples.	Fat.	Water.	Salt.	Curd.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Small	224	82.64	13.66	2.48	1.22
Medium	292	82.45	13.93	2.46	1.16
Large	102	81.87	14.20	2.80	1.13
Variation		.77	.54	.34	.09

TABLE 5.—*Average and range of temperature of churning according to seasons in which samples were taken.*

Season.	Average.	Highest.	Lowest.
	°*F.*	°*F.*	°*F.*
January, February, March	57	60	50
April, May, June	56	64	49
July, August, September	56	66	48
October, November, December	57	66	52

TABLE 6.—*Test of buttermilk according to seasons in which samples were taken.*

Season.	Average.	Highest.	Lowest.
	Per cent.	*Per cent.*	*Per cent.*
January, February, March	0.10	1.90	0.03
April, May, June	.19	1.90	.01
July, August, September	.20	1.30	.01
October, November, December	.13	.61	.02
Average of all samples	.17		

TABLE 7.—*Temperature of wash water according to seasons in which samples were taken.*

Season.	Average.	Highest.	Lowest.
	°F.	°F.	°F.
January, February, March	59	68	50
April, May, June	56	68	46
July, August, September	56	72	42
October, November, December	58	75	49

TABLE 8.—*Relation between moisture and fat content, the variations in the fat content of samples having fixed moisture content.*

Number of samples.	Per cent of samples.	Moisture.	Fat.		
			High.	Low.	Average.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
8	1.2	10 to 10.99	87.39	84.06	85.86
30	4.8	11 to 11.99	86.60	82.32	85.10
92	14.7	12 to 12.99	86.36	81.47	84.04
221	35.4	13 to 13.99	84.86	78.98	82.91
168	26.9	14 to 14.99	83.97	78.72	81.13
74	11.8	15 to 15.99	83.49	77.77	80.50
31	4.9	16 and over	81.17	73.49	78.70

TABLE 9.—*Relation between butterfat and moisture content, the variations in the moisture content of samples having fixed fat content.*

Number of samples.	Per cent of samples.	Butterfat.	Water.		
			High.	Low.	Average.
		Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
30	4.8	Below 79	20.65	13.92	16.33
27	4.3	79 to 79.99	17.56	13.64	15.37
73	11.6	80 to 80.99	16.78	13.12	14.89
110	17.6	81 to 81.99	16.39	12.45	14.38
128	20.5	82 to 82.99	15.20	12.30	13.90
132	21.1	83 to 83.99	15.06	12.05	13.37
88	14.1	84 to 84.99	13.80	10.93	12.79
24	3.8	85 to 85.99	12.91	10.66	11.90
12	1.9	86 and above	12.02	10.13	11.13

TABLE 10.—*Churning conditions of all samples containing 84 per cent fat or more.*

Average fat content of cream churned.....per cent..	28.04
Average acidity of cream churned, per cent.....	.51
Churning temperatures:	
Highest.....°F..	63
Lowest.....°F..	48
Average.....°F..	57.1
Length of time churned:	
Highest.....minutes..	120
Lowest.....do....	10
Average.....do....	46.1
Size of granules:	
Small.....samples..	60
Medium.....do....	50
Large.....do....	13
Not given.....do....	1
	124
Temperature of wash water:	
Highest.....°F..	68
Lowest.....°F..	43
Average.....°F..	57
Revolutions in wash water:	
Highest.....	50
Lowest.....	2
Average.....	11.5
Revolutions in wash water (rollers in gear), 11 samples:	
Highest.....	25
Lowest.....	2
Number of revolutions worked:	
Highest.....	120
Lowest.....	9
Average.....	20.8

TABLE 11.—*Churning conditions of all samples containing less than 81 per cent fat.*

Average fat content of cream churned.....per cent..	27.8
Average acidity of cream churned, per cent.....	.503
Churning temperatures:	
Highest.....°F..	84
Lowest.....°F..	48
Average.....°F..	56.6
Length of time churned:	
Highest.....minutes..	330
Lowest.....do....	20
Average.....do....	53.6
Size of granules:	
Small.....samples..	41
Medium.....do....	56
Large.....do....	30
Not given.....do....	3
	130
Temperature of wash water:	
Highest.....°F..	68
Lowest.....°F..	48
Average.....°F..	57
Revolutions in wash water:	
Highest.....	82
Lowest.....	2
Average.....	19.4
Revolutions in wash water (rollers in gear), 32 samples:	
Highest.....	15
Lowest.....	2
Number of revolutions worked:	
Highest.....	105
Lowest.....	3
Average.....	21.1

(30 samples showed 16 per cent or more of water.)

TABLE 12.—*Churning averages of samples having 81 to 84 per cent of fat.*

Fat test of cream churned, per cent.....	28.01
Acidity of cream churned, per cent.....	.535
Time churned, minutes.....	45.9
Temperature at which churned, °F.....	56.8
Granules of butter:	
Small.....	130
Medium.....	176
Granules of butter—Continued.	
Large.....	62
Not given.....	2
	370
Temperature of wash water...°F..	57.3
Revolutions in wash water.....	14.2
Revolutions in wash water (rollers in gear, 59 samples).....	10.8
Number of revolutions worked....	19.94

AVERAGES BY STATES.

Tables 13 to 24, next following, show the average composition of creamery butter secured in this investigation in a number of selected States, namely, Minnesota, Wisconsin, Iowa, California, Pennsylvania, North Dakota, Texas, and Michigan.

MINNESOTA.

TABLE 13.—*Results of analyses of 223 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
Average	*Per cent.* 82.81	*Per cent.* 13.60	*Per cent.* 2.34	*Per cent.* 1.24
Highest	87.39	17.33	5.62	3.32
Lowest	77.53	10.13	.68	.12
Variations	9.86	7.20	4.94	3.20

NOTE.—The "highest" and "lowest" in the above table and similar tables are the highest and lowest in all the samples; that is, the highest fat percentage and the highest water percentage, for example, would not necessarily occur in the same sample.

TABLE 14.—*Number of samples having fixed percentages of each constituent, graduated from lowest to highest.*

Number of samples.	Fat.	Number of samples.	Water.	Number of samples.	Salt.	Number of samples.	Curd.
	Per cent.		*Per cent.*		*Per cent.*		*Per cent.*
1	77	2	10	8	Below 1	1	0.1
6	78	11	11	80	1	4	.2
3	79	46	12	91	2	7	.4
19	80	91	13	33	3	20	.6
37	81	54	14	9	4	31	.8
43	82	11	15	2	5	116	1.0
59	83	7	16			25	1.5
39	84	1	17			12	2.0
11	85					3	2.5
4	86					4	[1] 3.0
1	87						
223	.....	223	.....	223	.....	223	.....

[1] Or more.

NOTE.—In the above table and similar tables that follow the per cent given includes all fractions up to the next per cent given. Thus, 77 per cent includes all fractions up to 77.99 per cent.

WISCONSIN.

TABLE 15.—*Results of analyses of 117 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Average	82.48	13.77	2.61	1.14
Highest	86.75	18.23	5.46	2.12
Lowest	75.68	10.52	.95	.23
Variations	11.07	7.71	4.51	1.89

TABLE 16.—*Number of samples having fixed percentages of each constituent, graduated from lowest to highest.*

Number of samples.	Fat.	Number of samples.	Water.	Number of samples.	Salt.	Number of samples.	Curd.
	Per cent.		*Per cent.*		*Per cent.*		*Per cent.*
1	75	3	10	2	Below 1	1	0.2
2	77	5	11	34	1	3	.4
2	78	18	12	43	2	11	.6
3	79	47	13	23	3	30	.8
16	80	26	14	10	4	53	1.0
20	81	15	15	5	5	18	1.5
26	82	2	16			1	2.0
23	83	1	18				
16	84						
5	85						
3	86						
117	.....	117	.....	117	.....	117	.....

IOWA.

TABLE 17.—*Results of analyses of 131 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Average	82.11	14.24	2.51	1.12
Highest	86.08	18.54	5.96	3.25
Lowest	75.21	10.72	.94	.20
Variations	10.87	7.82	5.02	3.05

TABLE 18.—*Number of samples having fixed percentages of each constituent, graduated from lowest to highest.*

Number of samples.	Fat.	Number of samples.	Water.	Number of samples.	Salt.	Number of samples.	Curd.
	Per cent.		*Per cent.*		*Per cent.*		*Per cent.*
1	75	1	10	2	Below 1	5	0.20
6	78	4	11	41	1	6	.40
7	79	14	12	50	2	18	.60
19	80	33	13	28	3	22	.80
21	81	49	14	8	4	56	1.00
36	82	21	15	2	5	19	1.50
20	83	6	16			4	2.00
16	84	2	17			1	3.25
4	85	1	18				
1	86						
131	.....	131	.....	131	.....	131	.....

CALIFORNIA.

TABLE 19.—*Results of analyses of 95 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Average	82.12	14.19	2.64	1.05
Highest	86.91	20.65	5.17	3.41
Lowest	73.49	10.66	.94	.33
Variations	13.42	9.99	4.23	3.08

TABLE 20.—*Number of samples having fixed percentages of each constituent, graduated from lowest to highest.*

Number of samples.	Fat.	Number of samples.	Water.	Number of samples.	Salt.	Number of samples.	Curd.
	Per cent.		*Per cent.*		*Per cent.*		*Per cent.*
1	73	1	10	2	Below 1	1	0.2
3	78	4	11	17	1	12	.4
11	79	6	12	50	2	17	.6
9	80	31	13	16	3	24	.8
22	81	28	14	7	4	30	1.0
17	82	20	15	3	5	4	1.5
19	83	3	16			3	2.0
8	84	1	18			3	2.5
3	85	1	20			1	3.0
2	86						
95	.....	95	.....	95	.....	95	.....

PENNSYLVANIA.

TABLE 21.—*Results of analyses of 37 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
Average	*Per cent.* 82.81	*Per cent.* 13.53	*Per cent.* 2.63	*Per cent.* 1.03
Highest	85.64	16.88	5.21	1.72
Lowest	77.92	11.72	1.35	.52
Variation	7.72	5.16	3.86	1.20

NORTH DAKOTA.

TABLE 22.—*Results of analyses of 17 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
Average	*Per cent.* 82.40	*Per cent.* 13.63	*Per cent.* 2.81	*Per cent.* 1.15
Highest	84.83	15.73	4.29	2.70
Lowest	80.26	10.95	1.41	.48
Variation	4.57	4.78	2.88	2.22

TEXAS.

TABLE 23.—*Results of analyses of 15 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
Average	*Per cent.* 82.76	*Per cent.* 13.98	*Per cent.* 2.15	*Per cent.* 1.11
Highest	85.58	20.23	3.83	2.33
Lowest	79.95	11.04	1.03	.52
Variation	9.63	9.19	2.80	1.81

MICHIGAN.

TABLE 24.—*Results of analyses of 10 samples from the State.*

Percentage.	Fat.	Water.	Salt.	Curd.
Average	*Per cent.* 80.99	*Per cent.* 14.44	*Per cent.* 3.31	*Per cent.* 1.26
Highest	83.51	16.75	5.98	2.05
Lowest	75.93	13.09	1.46	.50
Variation	7.58	3.66	4.52	1.55

The results in Tables 14, 16, and 18, which concern the States of Minnesota, Wisconsin, and Iowa, are shown graphically in comparative form in figures 1 to 4. There is this difference, however, that whereas the tables give only the number of samples for each given per-

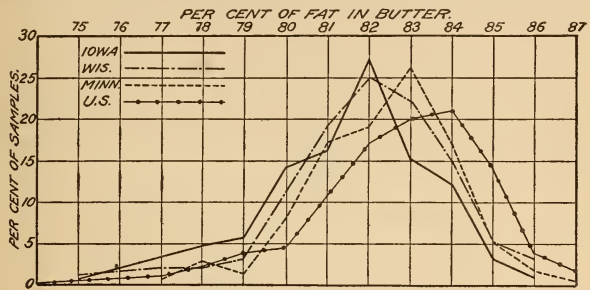

FIG. 1.—Diagram showing the fat content of the samples from Iowa, Wisconsin, and Minnesota, and of all samples in the investigation.

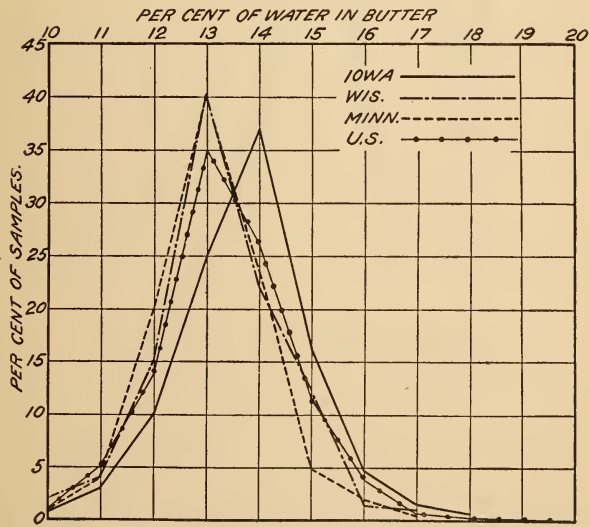

FIG. 2.—Diagram showing the moisture content of the samples from Iowa, Wisconsin, and Minnesota, and of all samples in the investigation.

centage of the various constituents of the butter, the diagrams show percentages of both samples and constituents. In addition there is added, for further comparison, a curve representing the percentages of all the samples in this investigation.

DETAILS OF SOME EXTREME SAMPLES.

In the succeeding four tables, Nos. 25 to 28, are found details of the samples, which gave, respectively, the highest fat and lowest water record, the highest water and lowest fat record, the lowest curd record, and the highest curd record.

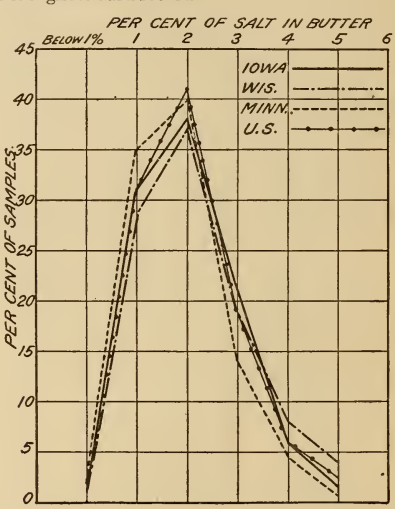

FIG. 3.—Diagram showing the salt content of the samples from Iowa, Wisconsin, and Minnesota, and of all the samples in the investigation.

TABLE 25.—*Composition and churning record of sample No. 503, which has the highest fat and lowest water content found in the investigation.*

Analysis: Butterfat 87.39, water 10.13, salt 1.76, curd 0.72; total, 100 per cent.

CHURNING RECORD.

Butter made.....pounds..	410	Temperature of buttermilk...°F..	58
Ripening temperature.....°F..	62	Amount of wash water.....gals..	100
When cooled.....	5.30 p. m.	Revolutions in wash water.....	5
Temperature when ready to churn, °F.....	57	Rollers in or out of gear.....	Out.
Length of time churning....min..	45	Number of revolutions worked....	22
Size of granules.....	Medium fine.	Kind of churn used.....	Victor F.

Churn cover closed tight while working the butter.

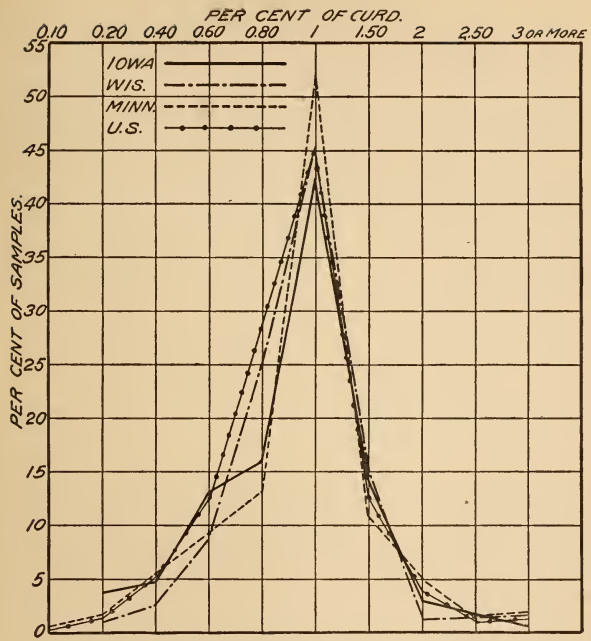

FIG. 4.—Diagram showing the percentage of curd in the samples from Iowa, Wisconsin, and Minnesota, and in all the samples in the investigation.

TABLE 26.—*Composition and churning record of sample No. 784, which has the highest water and lowest fat content found in the investigation.*

Analysis: Butterfat 73.49, water 20.65, salt 5.14, curd 0.72; total 100 per cent.

CHURNING RECORD.

Pounds of cream	1,800	Size of granules	Wheat.
Test of cream, per cent	30	Test of buttermilk, per cent	0.54
Pounds of butter made	600	Temperature of wash water, °F.	64
Pasteurizing temperature, °F.	180–185	Amount of wash water: 1st, as much as cream; 2d, one-third as much.	
Ripening temperature, °F.	48		
When cooled	All night.	Revolutions in wash water	4
Temperature when ready to churn, °F.	50	Rollers in or out of gear	In.
Kind of churn used	S.	Length of time worked, min.	6
Length of time churning, min.	60		

Churn cover closed tight while working the butter.

TABLE 27.—*Composition and churning record of sample No. 417, which has the lowest curd content found in the investigation.*

Analysis: Butterfat 84.62, water 13.60, salt 1.66, curd 0.12; total 100 per cent.

CHURNING RECORD.

Pounds of cream	1,313	Size of granules	Navy beans.
Pounds of fat in cream	360	Temperature of buttermilk...°F.	60
Pounds of butter made	430	Test of buttermilk.....per cent.	0.8
Per cent of fat in cream	27.4	Temperature of wash water...°F.	55
Pasteurization temperature...°F.	150	Amount of wash water: Same as buttermilk.	
Ripening temperature.....°F.	65	Revolutions in wash water	12
When cooled	2 to 6.30	Rollers in or out of gear	Out.
Temperature when ready to churn, °F.	59	Length of time worked.....min.	2¾
Kind of churn used	D. No. 4.	Number of revolutions worked	18
Length of time churning....min.	25		

Churn cover closed tight while working the butter.

TABLE 28.—*Composition and churning record of sample No. 553, which has the highest curd content found in the investigation.*

Analysis: Butterfat 81.21, water 13.85, salt 1.52, curd 3.42; total 100 per cent.

CHURNING RECORD.

Pounds of cream	[1] 11,335	Length of time churning....min.	40
Test of cream.....per cent.	30.6	Size of granules	Wheat.
Pounds of fat in cream	[1] 3,476	Temperature of buttermilk...°F.	58
Pounds of butter made	[1] 4,349	Test of buttermilk.....per cent.	0.13
Ripening temperature.....°F.	56	Temperature of wash water...°F.	60
Acidity when ready to churn, per cent	0.7	Amount of wash water.....gals.	100
Temperature when ready to churn, °F.	57	Revolutions in wash water	10
Kind of churn used	D. No. 6.	Rollers in or out of gear	Out.
		Length of time worked ...min.	5 to 10
		Number of revolutions worked	18

Churn cover closed tight while working the butter.

NAVY BUTTER.

Navy butter, in this article, has reference to the creamery butter made and packed for the Navy Department under the supervision of the Dairy Division, under contract to conform to specifications prepared by the division.

The specifications affecting the composition of the butter read as follows:

Butter.—Shall be fresh butter made during such period of 90 days to be stated in proposal after April 15, 1910, and before August 15, 1910, as shall be most suitable for butter making in the locality of the creamery where it is to be made, from pasteurized milk or cream, none of which shall contain before pasteurization more acid in 50 c. c. than will be neutralized by 15 c. c. or 13 c. c. of N/10 alkali solution, as determined by Mann's acid test, for butter scoring 94 and 95, respectively.

[1] One day's make, several churnings.

Quality.—Shall be strictly of the grade of creamery extras and must score not less than 94 and 95, respectively, at the time of packing.

Composition.—Moisture in the butter must not exceed 13 per cent. There must be no preservative used other than common salt, and that shall be at a rate giving not less than 2½ per cent or more than 3¼ per cent salt in the butter at time of packing.

Inspection.—The ingredients, manufacture, sanitation, packing, boxing, marking, and shipping of the butter shall be subject to inspection by Government inspectors, who shall have full authority to reject any lot of milk, cream, or the finished butter, or any other requirement which does not conform in every respect to these specifications.

Tests.—The Government inspector shall make all the necessary tests to determine that the acid in the milk or cream and the salt and moisture contents in the butter are within the limits specified.

The samples of Navy butter analyzed in this investigation gave the following results:

TABLE 29.—*Composition of 34 samples of Navy butter.*

Percentage.	Fat.	Water.	Salt.	Curd.
	Per cent.	*Per cent.*	*Per cent.*	*Per cent.*
Average	84.13	12.21	2.72	0.94
Highest	85.46	13.09	3.18	1.81
Lowest	82.90	11.19	2.02	.48
Variation	2.56	1.90	1.16	1.33
SAMPLES DIVIDED ACCORDING TO SIZE OF GRANULES AT TIME CHURNING WAS COMPLETED.				
Large granules	84.27	12.10	2.70	0.92
Medium granules	83.69	12.69	2.68	.93
Small granules	84.31	11.93	2.78	.97

TABLE 30.—*Churning conditions of samples of Navy butter.*

Average fat content of cream churned	per cent	31	
Average acidity of cream churned	per cent	0.164	
Churning temperatures:			
Highest	°F.	56	
Lowest	°F.	46	
Average	°F.	51	
Length of time churned:			
Highest	minutes	120	
Lowest	do	30	
Average	do	55	
Size of granules:			
Small	samples	11	
Medium	do	10	
Large	do	13	
		34	
Temperature of wash water:			
Highest	°F.	51	
Lowest	°F.	42	
Average	°F.	46	
Revolutions in wash water (rollers out of gear):			
Highest		12	
Lowest		4	
Average		9.5	
Revolutions butter was worked:			
Highest		33	
Lowest		13	
Average		22	

APPENDIX.

The detailed analyses of all the samples in this investigation are given in the two following tables. Table I records the general samples, and Table II the samples of Navy butter.

TABLE I.—*Detailed analyses of samples of American creamery butter.*

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.[1]	Churning temperature.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers in gear.	Rollers out of gear.	
		Per ct.	*Per ct.*	*P. ct.*	*P. ct.*	*Lbs.*	*P. ct.*	*P. ct.*		*Mins.*		° *F.*	° *F.*			
1	July.....	79.58	15.37	3.94	1.11	.....	31	0.64	I	100	S	60	60	6	.....	32
2	...do.....	79.23	15.70	4.36	.71	.....	29	.66	I	95	M	60	60	6	.....	32
3	...do.....	79.77	15.00	3.96	1.27	.....	25	.....	G	60	S	58	58	....	12	12
4	...do.....	80.75	13.66	4.02	1.57	.....	25	.....	G	45	S	59	58	....	12	12
5	...do.....	79.40	14.17	5.17	1.26	.....	25	.....	G	35	S	60	58	....	12	12
7	August.....	81.00	14.54	3.59	.87	1,010	30	.60	I	58	S	57	66	....	8	15
11	July.....	83.25	14.31	1.31	1.13	228	33	.....	I	45	S	50	52	....	8	....
12	June.....	82.00	14.51	2.41	1.08	658	25	.60	I	55	S	58	54	....	11	11
13	July.....	81.41	15.02	2.69	.88	504	25	.....	I	35	M	59	48	....	14	12
14	...do.....	84.38	12.93	1.88	.81	571	28	.....	I	75	M	48	53	....	12	22
15	...do.....	82.14	14.05	1.97	1.84	185	33	.....	I	45	M	55	52	....	20	15
16	...do.....	84.13	13.58	1.58	.71	580	31	.....	I	105	M	54	56	....	12	....
17	...do.....	85.98	12.31	1.05	.66	161	.....	.....	I	35	L	52	50	....	3	14
18	June.....	79.93	14.76	4.45	.86	732	25	.....	I	30	S	62	58	....	33	13
19	...do.....	81.91	14.95	2.28	.86	859	26	.....	I	28	S	62	48	5	.....	7
20	July.....	84.25	12.99	1.87	.89	530	24	.....	I	45	M	53	53	....	.....	20
21	...do.....	80.38	15.85	2.85	.92	2,386	.....	.....	I	30	L	56	50	2	.....	12
22	...do.....	81.37	14.52	3.34	.77	1,195	.....	.....	O	45	L	56	60	....	10	25
23	...do.....	82.86	14.50	1.77	.87	625	27	.....	I	45	M	60	52	....	20	20
24	...do.....	82.00	14.19	2.59	1.22	500	.....	.....	B	55	M	50	50	....	7	18
26	...do.....	83.07	13.47	2.45	1.01	1,429	26	.....	B	40	M	54	52	....	4	18
27	...do.....	82.04	14.11	3.71	1.14	690	28	.....	B	70	L	54	60	....	10	25
28	...do.....	85.34	12.46	1.19	1.01	591	29	.....	B	45	M	63	52	....	30	22
29	...do.....	80.49	15.28	2.84	1.39	315	.....	.....	B	40	M	54	54	5	.....	18
30	...do.....	82.74	14.58	1.90	.78	580	.....	.....	I	60	L	52	55	....	11	14
31	November	80.79	14.22	3.91	1.08	607	22	.....	B	30	M	62	58	....	15	18
33	December	80.51	14.90	3.52	1.57	2,294	21	.....	E	40	S	60	60	....	12	22
35	September	79.10	17.56	2.17	1.17	.....	.....	.36	F	60	M	54	52	10	.....	23
40	November	83.78	13.13	1.72	1.37	163	26	.....	I	45	M	60	54	6	.....	20
44	April.....	84.28	13.41	1.62	.69	896	34	.52	G	35	M	54	55	....	6	12
47	July.....	80.23	14.45	4.59	.73	732	26	.50	G	40	S	52	52	....	3	....
54	August.....	84.28	12.33	2.02	1.37	662	29	.54	B	75	L	60	58	....	2	22
55	...do.....	80.31	14.36	4.40	.93	600	.....	.....	I	60	S	54	56	....	15	15
59	...do.....	84.09	13.10	1.88	.93	629	25½	.65	B	95	L	61	58	....	6	33
60	...do.....	83.49	13.22	2.05	1.24	640	27½	.59	B	52	L	60	58	....	2	22
61	July.....	80.91	14.76	3.39	.94	650	32	.50	G	40	S	51	48	....	7	19
63	August.....	81.85	13.81	3.83	.51	315	.....	.....	G	30	M	57	57	....	10	20
64a	...do.....	84.70	12.12	1.89	1.29	336	26	.....	B	50	S	57	58	....	17	26
72	...do.....	84.09	12.51	2.77	.63	335	28	.....	B	40	L	57	61	....	10	17
73	...do.....	83.27	13.63	1.95	1.15	373	32	.....	I	45	M	50	60	....	6	9
100a	October...	81.98	14.65	2.79	.58	1,240	27½	.....	G	90	S	59	61	....	71	14
101	...do.....	82.45	14.07	2.77	.71	1,240	27½	.....	G	50	S	58	58	....	81	14
105	July.....	75.68	18.23	5.46	.63	1,183	.....	.....	I	25	L	52	54	10	.....	15
106	...do.....	80.85	15.19	2.41	1.55	630	35	.....	G	40	M	52	52	....	8	20
107	...do.....	82.21	15.20	1.33	1.26	126	22	.....	B	30	M	58	53	....	6	12
108	...do.....	83.20	12.48	3.79	.53	910	.....	.49	I	75	M	49	52	....	20	18
109	...do.....	84.07	13.02	1.99	.92	389	.....	.....	I	90	M	52	52	....	10	14
110	...do.....	79.37	16.65	3.04	.94	424	.....	.....	F	210	S	52	50	....	10	60
111	...do.....	84.38	13.50	1.02	1.10	.....	.....	.....	I	45	M	53	52	....	15	18
112	...do.....	81.80	14.49	2.94	.77	767	31	.....	I	60	L	58	60	....	30	12

[1] The letters in this column stand for small, medium, and large. Granules the size of a grain of wheat and less are called "small"; those as large as a pea or bean are called "medium"; and when larger than a bean they are called "large."

TABLE I.—*Detailed analyses of samples of American creamery butter*—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Churning temperature of wash water.	Temperature of wash water.	Revolutions in wash water.		Revolutions in gear.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers out of gear.		
		Per ct.	*Per ct.*	*Per ct.*	*Per ct.*	*Lbs.*	*P. ct.*	*P. ct.*		*Mins.*		*° F.*	*° F.*			
115	August...	84.79	12.28	2.24	0.69	182	.....	.....	B	60	M	53	54	.....	.....	22
123	November	82.73	13.90	2.04	1.33	1,560	.....	0.36	B	40	S	60	64	14	.....	28
124	...do.....	82.27	14.30	2.82	.61	545	19	.....	I	60	S	58	59	15	.....	.....
126	...do.....	81.82	14.07	2.47	1.64	840	25	.....	G	70	S	54	54	.....	12	.....
130	July.....	77.92	15.99	5.21	.88	697	22	.47	G	100	M	52	50	.....	12	21
132	...do.....	78.80	16.42	3.95	.83	700	24	.47	G	100	M	50	50	.....	6	17
138	August...	84.85	12.41	2.15	.59	410	.....	.52	D	40	S	53	62	.....	20	18
139	...do.....	82.77	13.60	2.64	.99	453	.....	.....	D	35	S	53	54	.....	11	23
140	...do.....	83.28	12.74	2.14	1.84	236	21½	.....	I	48	M	52	52	.....	5	11
141	...do.....	80.28	13.74	5.16	.82	380	.....	.50	I	45	M	52	65	.....	25	6
142	...do.....	81.77	14.00	3.24	.99	440	.....	.....	I	45	M	58	58	.....	100	15
143	July.....	84.20	13.60	1.27	.93	415	28	.....	B	30	M	61	54	.....	10	18
144	...do.....	83.22	12.04	3.97	.77	251	27	.....	I	35	M	58	59	.....	20	18
145	...do.....	83.54	13.35	1.91	1.20	723	28	.....	B	30	M	61	54	.....	12	19
146	August...	81.27	13.88	2.24	2.61	453	26	.65	B	35	M	59	60	.....	12	27
147	July.....	83.68	14.04	1.79	.49	655	24	.....	B	22	S	57	52	.....	12	17
153	...do.....	82.23	14.31	2.68	.78	712	30½	.37	B	40	L	56	64	.....	10	16
154	...do.....	81.15	14.78	3.04	1.03	810	41½	.42	I	45	L	54	68	.....	6	14
155	...do.....	82.25	14.31	2.76	.68	.....	.....	.55	B	40	L	56	64	.....	12	18
156	...do.....	81.75	14.45	2.77	1.03	900	.....	.52	B	50	L	56	60	.....	12	18
157	...do.....	78.80	16.83	3.09	1.28	800	.....	.43	B	50	L	56	62	.....	12	18
158	...do.....	82.93	13.78	2.39	1.40	411	.....	.....	B	35	L	57	50	.....	7	19
159	...do.....	82.50	14.57	2.30	.63	.....	.....	.....	I	40	M	56	54	.....	7	18
160	...do.....	81.30	15.05	3.14	.51	.....	.....	.....	B	60	L	55	52	10	.....	24
161	...do.....	82.09	14.80	1.53	1.58	.....	.....	.....	I	60	M	55	52	7	.....	30
162	...do.....	80.01	15.11	4.21	.67	.....	.....	.68	B	45	S	54	50	.....	12	35
168	December.	83.66	15.13	1.93	1.68	389	24	.68	I	48	M	60	60	.....	12	18
169	August...	78.66	15.10	5.14	1.10	424	26	.....	I	45	M	56	50	3	7	12
176	...do.....	81.62	14.67	2.90	.81	420	22	.....	I	35	S	55	52	.....	20	12
177	July.....	83.31	13.90	1.27	1.52	298	.....	.....	I	40	S	53	52	.....	7	.....
178	...do.....	81.64	13.49	4.27	.60	360	32	.38	I	40	S	54	50	.....	6	9
179	August...	78.82	16.63	3.48	1.07	582	.....	.....	I	60	M	58	53	.....	29	11
180	...do.....	84.01	13.65	1.49	.85	780	26	.....	E	55	M	55	52	.....	8	18
185	October..	84.83	12.65	2.16	.36	607	30	.....	D	40	M	58	57	4	.....	15
191	July.....	85.16	11.04	2.66	1.14	500	.....	.15	B	50	L	52	49	.....	10	29
192	August...	82.27	14.09	2.83	.81	.....	33	.....	G	35	S	59	56	.....	8	13
193	...do.....	83.38	13.27	2.46	.89	.....	27	.....	G	35	S	58	57	.....	4	11
194	...do.....	82.21	14.05	2.81	.93	568	32½	.60	I	35	M	57	61	32	12	23
203	November	84.03	13.52	1.41	1.04	471	.....	.....	B	45	M	54	54	.....	20	20
205	August...	82.29	13.69	3.10	.92	700	35	.....	I	30	L	56	52	.....	7	12
206	...do.....	84.77	12.86	1.25	1.12	.....	.....	.....	I	60	M	52	52	.....	.....	.....
207	July.....	80.81	15.04	3.19	.96	1,701	.....	.....	I	50	M	53	52	.....	2	14
208	August...	75.21	18.54	4.61	1.64	372	34	.....	I	45	M	54	50	.....	20	20
209	...do.....	81.39	14.59	2.71	.84	1,008	30	.....	I	30	M	58	58	.....	4	8
210	...do.....	81.70	13.66	3.21	1.43	620	25	.....	I	35	M	51	53	.....	4	8
211	...do.....	82.16	15.02	1.28	1.54	693	.....	.....	I	30	M	56	53	10	.....	10
212	...do.....	82.53	14.12	2.07	1.28	155	25	.....	I	45	M	51	50	.....	10	14
213	...do.....	81.83	13.88	2.17	2.12	459	25	.....	I	65	S	50	52	10	.....	15
214	...do.....	80.23	13.28	4.34	1.03	390	25	.....	I	40	S	52	56	.....	12	15
220	...do.....	83.06	13.48	2.54	.92	.....	31	.....	G	60	L	64	55	.....	8	15
221	...do.....	80.87	15.15	2.79	1.19	.....	28	.....	G	50	L	64	54	.....	44	13
222	...do.....	82.74	14.05	2.54	.67	1,090	29	.....	G	60	L	63	54	.....	44	15
236	...do.....	84.27	12.24	2.30	1.19	2,068	.....	16	D	50	S	54	50	.....	12	20
243	...do.....	81.76	12.22	2.41	1.67	495	.....	.....	I	60	M	55	52	.....	.....	11
244	...do.....	82.88	14.42	1.24	1.46	568	23	.....	I	65	M	51	52	.....	10	12
247	...do.....	84.56	12.98	1.35	1.11	402	25	.....	I	45	S	52	53	.....	8	14
251	...do.....	80.62	15.45	3.06	.87	1,422	31	.....	G	45	M	62	53	.....	8	16
252	...do.....	81.68	14.92	2.74	.76	1,422	30	.....	G	30	L	64	52	.....	59	15
253	October..	83.76	12.70	1.53	2.01	345	27	.60	B	40	M	58	59	.....	4	24
254	...do.....	81.70	16.39	1.83	.61	324	32	.55	B	30	M	59	66	15	.....	20
255	January..	83.17	14.04	1.57	1.22	181	24	.45	B	30	M	66	68	.....	30	30
257	September	79.13	14.04	5.62	1.21	401	29	.....	E	25	M	58	59	.....	12	20
258	October..	83.41	13.84	1.45	1.30	310	31	.62	I	40	M	60	58	.....	4	15
259	January..	82.44	13.98	2.08	1.50	576	28	.45	B	30	S	61	59	.....	12	30
261	...do.....	81.15	13.95	3.45	1.45	792	23	.60	B	50	L	61	62	.....	30	30
262	October..	83.74	13.46	1.67	1.13	600	25	.58	B	40	M	57	56	.....	2	26
263	August...	82.62	14.11	1.87	1.40	587	.....	.66	E	30	M	56	50	.....	8	30
264	...do.....	82.74	13.31	2.60	1.35	844	32	.63	E	50	M	54	50	.....	8	33
265	...do.....	82.58	14.07	2.31	1.04	493	33½	.64	B	40	M	58	56	.....	10	26
266	...do.....	86.03	11.49	1.11	.87	226	30	.40	B	30	M	57	56	.....	10	22
269	September	84.34	13.80	.92	.94	531	.....	.....	I	120	S	54	62	.....	20	12
270	...do.....	77.53	16.79	3.60	2.08	472	.....	.....	G	45	M	50	52	.....	5	20

TABLE I.—*Detailed analyses of samples of American creamery butter*—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.		Size of granules.	Churning temperature of wash water.	Temperature of wash water.	Revolutions in wash water.	
		Butterfat.	Moisture.	Salt.	Curd.										In gear.	Rollers out of gear.
		Per ct.	*Per ct.*	*P. ct.*	*P. ct.*	*Lbs.*	*P. ct.*	*P. ct.*		*Mins.*		°*F.*	°*F.*			
271	September	83.67	13.70	1.39	1.24	286	25	.....	E	50	M	59	58	.....	22	25
278	July.....	80.54	15.36	3.20	.90	800	.....	0.23	B	55	L	54	60	.....	12	18
279	August....	81.81	14.64	2.46	1.09	712	.....	.30	B	50	L	54	60	.....	12	18
280	...do.....	82.81	13.38	2.89	.92	950	.....	.23	B	55	L	54	60	.....	12	16
281	...do.....	81.99	14.70	2.86	.45	500	.....	.29	B	35	S	52	58	.....	12	18
282	...do.....	81.43	13.88	3.57	1.12	800	.....	.25	B	40	L	54	60	.....	12	18
283	March.....	83.04	13.18	2.90	.88	600	.....	.....	B	40	M	58	58	.....	12	18
285	August....	80.86	16.43	1.76	.95	840	31	.....	I	60	L	53	54	.....	12	12
286	November	82.45	13.92	2.36	1.27	772	28	.....	I	90	M	56	56	.....	10	30
287	August....	82.21	13.99	3.06	.74	748	25	.....	I	105	M	56	54	.....	12	12
288	...do.....	83.36	13.56	2.15	.93	690	.....	.....	B	45	M	54	50	.....	4	28
289	...do.....	80.49	14.14	3.20	2.17	630	25	.....	I	40	M	52	52	.....	12	9
290	...do.....	80.27	16.78	1.94	1.01	1,035	30	.....	I	30	M	53	53	.....	38	15
291	...do.....	81.06	15.61	2.42	.92	1,126	.....	.....	I	60	M	54	52	.....	6	16
293	...do.....	80.86	14.73	3.62	.79	600	25	.....	I	70	M	56	52	.....	6	12
295	September	81.34	14.28	2.84	1.54	600	32	.....	B	60	M	54	54	26	.....	18
296	October...	82.53	14.84	1.86	.77	600	26	.....	B	60	M	54	50	.....	6	24
297	...do.....	80.67	14.70	3.36	1.27	117	.....	.....	B	60	M	53	52	.....	25	24
298	...do.....	82.20	13.76	3.74	.28	560	.....	.....	I	55	L	54	52	.....	30	25
299	...do.....	81.22	13.49	2.23	1.06	393	.35	.51	I	35	M	50	50	.....	10	18
300	August....	80.15	14.88	3.63	1.34	110	.....	.....	F	20	M	54	56	10	.....	35
301	...do.....	84.76	11.97	1.75	1.52	617	25	.64	E	68	M	55	52	.....	20	20
302	...do.....	82.85	14.42	1.59	1.14	1,000	40	.54	B	15	L	52	52	4	.....	18
303	...do.....	82.12	14.05	1.84	1.99	625	25	.59	I	71	M	55	54	.....	20	18
304	...do.....	82.48	14.00	1.55	1.67	494	30	.....	B	35	S	48	50	15	.....	15
305	September	83.38	13.52	1.98	1.12	194	.....	.70	I	75	S	54	54	.....	22	17
306	October...	85.02	12.21	1.44	1.33	202	.....	.....	E	30	S	60	53	.....	10	20
307	August....	83.34	14.20	1.13	1.33	317	.....	.....	I	50	M	52	50	.....	7	15
308	October...	83.43	12.89	1.53	2.10	222	.....	.....	E	45	M	58	52	.....	17	20
309	...do.....	81.24	14.54	2.23	1.99	450	26	.....	I	45	M	53	54	.....	6	12
311	August....	82.96	13.29	1.44	2.31	285	.....	.....	F	30	S	58	56	10	.....	.....
312	...do.....	82.30	14.20	1.85	1.65	656	25	.....	I	55	L	55	55	.....	6	10
313	...do.....	84.33	13.55	.99	1.13	470	.....	.....	I	60	L	56	52	8	.....	16
314	...do.....	81.13	14.90	2.79	1.18	419	28	.....	I	70	M	58	52	.....	30	15
315	September	83.64	12.72	1.35	1.29	265	.....	.....	E	45	M	58	52	.....	10	20
316	...do.....	83.96	12.70	1.60	1.74	1,000	.....	.....	E	60	L	51	56	.....	10	15
317	...do.....	81.51	15.29	1.73	1.47	265	.....	.....	I	45	M	57	60	10	12	10
318	October...	80.73	14.18	4.05	1.04	600	33	.....	B	60	M	57	56	.....	10	25
319	August....	82.41	14.60	2.36	.63	449	30½	.....	B	60	L	56	54	.....	10	25
322	September	79.71	13.74	4.11	2.44	629	30	.....	H	60	L	57	55	.....	12	72
323	August....	80.27	15.14	2.41	2.18	705	29	.....	G	60	L	57	62	.....	66	13
324	...do.....	79.75	13.64	4.09	2.52	560	27	.....	G	120	M	63	58	.....	9	18
326	September	81.86	14.76	2.16	1.22	.....	26	.....	G	16	S	63	61	.....	5	12
327	...do.....	78.98	13.92	4.14	2.96	207	24	.45	H	65	S	56	62	.....	13	105
328	August....	81.98	14.22	2.50	1.30	4,400	29½	.....	G	40	M	66	60	.....	.....	12
329	...do.....	84.93	12.65	1.90	.52	.....	33	.....	G	40	M	61	43	.....	4	13
330	...do.....	83.00	14.48	1.19	1.33	.....	.....	.69	G	30	M	65	58	.....	83	9
331	...do.....	81.59	14.32	2.70	1.39	.....	32	.....	G	40	S	60	42	.....	4	14
332	...do.....	81.78	13.78	2.79	1.65	.....	34	.....	G	45	M	60	44	.....	4	13
334	...do.....	78.72	14.66	3.27	3.41	.....	30	.....	G	20	S	58	45	.....	5	16
335	...do.....	79.78	14.87	2.74	2.61	.....	31	.65	G	60	L	64	59	.....	82	15
337	...do.....	81.77	12.70	3.78	1.75	.....	27½	.....	B	50	M	61	68	.....	27	15
338	...do.....	82.68	13.56	2.79	.97	.....	37	.....	G	30	S	61	56	.....	20	20
339	...do.....	83.19	12.62	3.01	1.18	.....	32½	.50	G	40	M	65	59	.....	85	15
340	...do.....	86.91	11.13	.94	1.02	.....	27	.....	B	60	S	62	67	.....	30	15
360	September	80.45	15.03	2.56	1.96	506	30	.....	I	45	M	54	50	2	.....	11
361	...do.....	77.64	16.61	4.47	1.28	500	32	.....	B	50	S	56	64	.....	2	15
364	August....	80.80	14.30	3.24	1.66	950	.....	.29	B	55	L	54	62	.....	12	18
365	...do.....	78.78	16.39	4.06	.77	1,050	.....	.28	B	70	L	54	60	.....	12	18
369	...do.....	82.65	13.10	3.14	1.11	1,000	.....	.28	B	60	L	54	58	.....	12	18
370	September	83.08	13.09	3.20	.63	385	28	.....	G	60	L	55	58	.....	20	24
371	August....	81.67	13.84	3.21	1.28	450	.....	.29	B	20	L	54	58	.....	12	18
372	...do.....	81.93	14.15	2.89	1.03	900	.....	.27	B	30	S	52	58	.....	12	18
373	October...	83.51	13.83	1.46	1.20	325	.....	.....	B	20	S	55	58	.....	3	14
374	...do.....	79.46	15.11	4.93	.50	700	.....	.....	I	60	S	56	60	.....	9	12
375	...do.....	82.63	13.90	2.60	.87	567	.....	.....	B	30	S	56	56	.....	5	22
381	September	81.84	15.25	1.82	1.09	560	.....	.....	E	60	M	50	56	.....	12	18
383	...do.....	82.69	13.94	2.21	1.16	291	.....	.....	I	40	L	54	54	.....	10	13
384	August....	80.96	13.57	4.32	1.15	545	.....	.....	D	60	L	53	51	9	.....	24
385	September	84.06	13.20	1.37	1.37	582	22	.....	I	45	S	52	58	.....	10	10
386	...do.....	82.35	13.89	2.31	1.15	700	.....	.....	I	60	M	58	56	.....	10	14
387	...do.....	81.74	14.31	3.07	.88	623	23	.....	B	75	L	58	58	.....	12	27

TABLE I.—*Detailed analyses of samples of American creamery butter*—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.								Rollers in gear.	Rollers out of gear.	
		Perct.	*Perct.*	*P. ct.*	*P. ct.*	*Lbs.*	*P. ct.*	*P. ct.*		*Mins.*		°*F.*	°*F.*		
388	August	82.41	13.09	3.38	1.12	632	23	.....	I	60	M	56	51	....	4	26
389	...do	81.93	13.65	3.34	1.08	236	.....	.....	I	30	M	56	52	2	13	12
390	...do	78.89	14.54	5.24	1.33	515	.....	.....	I	25	L	57	54	....	10	20
391	September	81.39	15.70	1.41	1.50	530	.....	.....	I	40	M	57	63	8	.....	8
392	...do	77.09	16.52	5.26	1.13	750	.....	0.56	I	30	L	56	61	5	1	15
393	...do	85.51	12.89	.95	.65	407	.....	.....	D	40	S	....	52	....	4	15
394	...do	83.54	12.98	2.07	1.41	498	.....	.54	I	45	M	58	54	....	20	24
395	...do	84.37	12.15	1.64	1.84	365	.....	.42	I	75	M	50	56	....	10	.....
396	September	83.43	13.75	1.81	1.01	395	.....	.....	G	70	M	54	52	....	10	12
397	August	83.38	13.73	2.00	.89	395	.....	.....	I	20	L	54	54	....	12	13
398	...do	82.52	13.50	2.75	1.23	620	.....	.....	I	40	S	....	52	....	10	19
399	...do	81.89	12.45	3.71	1.95	550	23	.....	I	30	S	56	54	....	8	22
400	...do	80.95	13.78	3.36	1.91	467	.....	.....	I	35	S	50	54	4	.....	16
401	...do	82.55	14.12	2.37	.96	500	.....	.....	I	35	L	56	58	....	6	10
402	...do	81.60	14.41	2.64	1.35	445	.....	.....	I	35	L	56	51	....	18	18
403	...do	83.80	13.18	.97	2.05	423	31	.....	B	35	S	58	58	....	2	25
404	...do	83.88	13.59	.96	1.54	199	22½	.50	B	35	S	60	62	....	20	25
405	September	79.08	15.25	4.48	1.19	965	.....	.....	E	70	L	57	66	....	35	45
406	...do	81.32	14.30	2.43	1.95	499	.....	.40	B	48	L	60	59	....	2	26
410	August	85.01	12.07	1.73	1.19	586	27	.....	B	20	M	62	52	....	12	18
411	...do	81.95	13.63	3.20	1.22	530	26	.60	B	45	L	61	53	....	8	18
412	...do	84.22	13.35	.78	1.65	375	31	.....	B	30	S	59	58	....	.....	.....
413	...do	83.03	13.89	1.98	1.10	635	27½	.....	B	18	L	63	58	....	11	10
414	September	78.65	16.12	4.06	1.17	856	.....	.....	E	75	L	57	66	....	35	37
415	August	82.92	14.17	1.70	1.21	354	25	.65	B	28	M	61	62	....	14	25
416	...do	83.21	13.67	1.68	1.44	423	27½	.....	B	25	S	63	56	....	10	27
417	...do	84.62	13.60	1.66	.12	430	27	.....	B	25	L	60	55	....	12	18
418	...do	83.35	12.52	3.61	1.42	566	29	.....	B	55	M	60	55	....	8	20
419	...do	84.60	13.14	1.24	1.02	426	32	.60	B	40	L	54	60	....	10	15
420	September	80.31	15.05	3.82	.82	992	.....	.....	E	85	L	57	66	....	35	45
421	August	84.01	12.76	1.95	1.28	424	26½	.60	B	33	S	61	62	....	20	26
422	...do	83.28	13.17	1.91	1.64	414	24	.60	B	45	S	59	62	....	25	25
423	September	83.96	13.25	2.01	.78	541	.....	.....	B	43	L	60	59	....	2	26
424	August	83.30	13.85	2.13	2.60	833	26	.....	B	45	L	61	53	....	8	18
425	...do	83.41	13.46	2.61	.52	572	25	.50	B	80	S	61	63	....	15	15
426	September	83.60	13.12	2.09	1.19	571	30	.....	B	71	S	58	57	....	2	32
427	August	83.45	13.62	1.92	1.01	428	27	.....	B	23	M	60	55	....	10	18
428	...do	86.60	11.51	.98	.91	423	31	.....	B	30	S	58	58	....	2	25
429	...do	84.23	13.65	2.12	1.00	418	24	.20	B	35	S	63	61	....	20	23
436	September	83.43	13.19	2.46	.92	420	.....	.....	I	60	L	54	65	2	6	10
437	...do	81.87	13.05	3.03	2.05	531	30	.....	B	60	S	55	56	7	.....	20
438	...do	75.93	16.75	5.98	1.34	370	27	.....	G	40	M	52	53	....	10	18
445	...do	81.85	13.87	2.43	1.85	618	25	.....	B	40	M	62	60	12	.....	12
455	August	81.06	14.98	1.72	2.24	239	33	.....	E	55	M	54	63	....	10	21
456	September	83.56	14.09	2.04	2.31	423	31	.34	B	45	L	52	62	....	10	20
457	...do	83.51	12.74	1.59	2.16	202	30	.68	B	25	M	59	61	....	7	20
458	...do	82.34	14.14	1.44	2.08	600	27	.65	B	40	M	58	65	10	.....	25
459	August	83.48	13.06	1.45	2.01	116	30	.65	B	45	S	62	58	....	10	26
461	...do	84.46	12.16	1.83	1.55	415	32	.55	E	50	M	57	62	....	10	24
462	October	81.57	13.15	3.74	3.04	403	28	.65	I	60	S	54	64	....	8	12
463	August	83.20	13.80	1.54	1.46	655	35	.60	B	33	S	56	60	....	25	25
464	October	85.36	11.59	1.09	1.96	1.050	27	.55	B	75	M	55	58	....	10	14
465	...do	81.32	14.08	3.43	1.17	870	29	.60	I	60	S	58	72	3	12	20
466	August	80.40	13.82	4.59	1.19	818	27½	.67	I	35	M	56	62	....	25	15
467	...do	81.37	13.97	3.42	1.24	773	.....	.59	B	45	S	59	64	....	45	25
468	...do	83.30	13.99	1.36	1.35	345	26	.....	B	60	M	54	58	....	20	15
469	September	82.02	14.17	2.36	1.45	583	30	.50	B	40	S	58	58	....	10	26
470	...do	82.82	13.16	2.28	1.74	567	32	.60	B	45	M	54	58	....	8	25
471	...do	82.27	13.58	2.77	1.38	720	26	.65	B	35	M	62	60	....	12	26
472	...do	84.01	13.09	1.82	1.08	651	32½	.....	B	75	M	59	62	....	25	18
473	...do	83.46	13.13	2.53	1.30	528	30	.58	B	75	L	55	54	5	.....	20
474	...do	85.02	12.07	1.85	1.06	617	32	.50	B	60	S	58	54	....	10	20
475	August	81.18	13.67	3.62	1.53	550	29	.65	B	55	S	55	48*	....	10	30
476	...do	83.12	13.97	1.43	1.48	564	22	.68	I	40	M	60	62	....	5	19
477	September	84.48	13.19	1.14	1.19	420	29	.68	I	60	M	57	58	....	20	14
479	August	81.51	15.53	1.85	1.11	477	30	.61	E	40	L	60	64	15	.....	25
480	September	82.10	14.24	2.33	1.33	253	.....	.....	E	40	M	56	54	....	7	20
481	...do	80.30	14.63	3.63	1.44	790	.....	.....	B	60	M	54	50	....	5	18
482	October	82.54	14.03	2.09	1.34	1.546	.....	.....	B	75	M	56	56	....	10	25
483	September	81.18	14.04	3.03	1.75	657	.....	.....	B	60	L	55	54	....	10	22
485	August	79.80	15.11	2.66	2.43	311	.....	.....	B	40	M	56	52	....	8	25
486	October	84.37	11.86	.76	3.01	364	30	.....	B	45	M	58	60	....	26	18

TABLE I.—*Detailed analyses of samples of American creamery butter*—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Churning temperature of wash water.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers in gear.	Rollers out of gear.	
		Per ct.	*Per ct.*	*P. ct.*	*P. ct.*	*Lbs.*	*P. ct.*	*P. ct.*		*Mins.*		°*F.*	°*F.*			
487	October...	83.44	13.25	2.21	1.10	504	.....	.....	B	45	M	57	56	....	10	14
488	...do.....	84.99	12.73	1.37	.91	256	.....	.....	B	40	S	54	50	....	8	21
489	November	82.02	14.80	1.72	1.46	624	21	.....	B	90	M	62	58	....	15	14
490	August.....	84.10	12.17	2.37	1.36	583	.....	.....	B	50	M	56	58	....	12	24
491	March.....	82.09	14.15	2.14	1.62	591	.....	.....	E	60	S	52	59	10	.....	28
492	February .	84.28	12.59	1.96	1.17	186	24	.....	B	45	M	58	56	....	14	.....
493	March.....	83.30	13.52	1.80	1.38	.....	27	.....	B	35	M	56	60	....	20	24
494	...do.....	80.90	15.05	2.67	1.38	524	25	.....	I	80	M	59	62	5	.....	28
495	...do.....	83.23	13.62	1.78	1.37	463	25	.....	B	90	M	59	62	4	6	24
496	...do.....	80.64	13.12	2.92	3.32	630	38	0.35	B	35	M	55	55	....	6	30
497	...do.....	81.53	14.77	2.32	1.38	519	36	.....	B	90	M	58	62	12	.....	24
498	...do.....	83.36	13.43	1.85	1.36	598	22	.....	B	60	S	....	60	....	8	25
499	...do.....	83.11	12.66	2.20	2.03	388	24	.....	I	45	S	60	60	....	8	20
500	...do.....	84.36	12.29	1.98	1.37	500	.....	.....	B	45	S	57	54	....	7	20
501	...do.....	82.11	12.80	3.02	2.07	635	28	.....	B	60	M	54	52	10	.....	25
502	...do.....	83.56	13.33	1.51	1.60	563	.....	.....	I	90	M	58	60	....	10	14
503	...do.....	87.39	10.13	1.76	.72	410	.....	.....	I	45	M	58	.....	....	5	22
504	April.....	80.97	14.61	3.57	.85	879	25	.....	I	20	L	57	58	4	6	22
507	May.....	80.87	16.19	1.64	1.30	.....	.....	.....	B	35	S	64	68	....	9	10
518	April.....	84.06	10.95	1.29	.70	174	24	.27	B	25	M	50	60	....	8	64
519	...do.....	83.88	13.14	1.79	1.19	280	25	.34	B	15	M	52	56	....	7	62
524	September	81.01	14.64	3.57	.78	504	28	.....	I	19	M	61	52	....	16	24
525	May.....	81.45	15.40	2.48	.67	582	27	.....	E	45	S	58	54	....	10	20
526	October...	82.94	13.39	1.79	1.98	166	24	.55	B	60	S	54	49	13	.....	17
537	September	81.89	13.92	2.72	1.47	463	27	.50	B	55	S	56	57	....	10	25
538	October...	84.82	13.36	2.32	.50	795	33	.....	E	30	M	57	57	.....	.....	28
541	August....	83.34	13.37	1.53	1.76	313	34	.45	B	35	S	54	58	.....	20	25
549	September	78.87	15.01	2.95	3.17	384	33	.65	B	40	S	49	58	.....	25	40
551	October...	82.46	13.43	2.26	1.85	310	30	.....	B	35	M	56	60	.....	25	28
552	September	81.81	13.34	3.17	1.68	834	28	.52	B	45	S	54	54	.....	12	30
553	...do.....	83.21	13.85	1.52	3.42	[1] 4,569	30	.70	B	40	S	58	60	.....	10	18
556	October...	78.79	15.64	3.28	2.29	675	27	.51	G	40	.....	54	52	.....	18	18
562	...do.....	80.78	14.84	2.69	1.69	240	30	.....	B	27	M	53	53	.....	18	22
563	November	83.34	13.72	1.04	1.90	182	25½	.....	B	30	M	58	50	.....	5	25
564	December.	80.75	14.53	2.91	1.81	290	.....	.....	B	90	S	58	58	.....	12	25
565	November	80.11	14.61	2.06	3.22	404	28½	.....	B	70	M	57	60	.....	5	30
566	...do.....	79.74	14.67	2.34	3.25	630	24	.....	I	45	S	62	56	.....	20	19
567	December.	84.25	12.37	1.71	1.67	645	30	.....	E	60	M	60	59	.....	6	20
568	...do.....	82.33	13.92	2.52	1.23	570	25½	.....	B	35	L	60	60	15	5	25
569	...do.....	78.43	16.34	3.58	1.65	545	.....	.71	E	105	S	58	57	.....	10	9
570	...do.....	81.25	14.71	2.24	1.80	610	.....	.71	E	60	S	59	59	.....	10	22
571	...do.....	84.14	10.49	3.24	1.13	808	32	.43	C	30	L	56	56	.....	20	20
572	September	78.74	15.46	4.04	1.76	750	29	.....	B	25	L	54	55	10	.....	25
573	...do.....	79.66	17.49	1.15	1.70	692	.....	.....	I	60	M	52	58	.....	10	13
574	...do.....	84.01	11.18	3.80	1.01	390	.....	.....	E	40	M	56	52	.....	32	24
575	...do.....	82.42	13.92	2.57	1.09	570	28	.....	B	30	S	58	54	.....	25	20
576	...do.....	84.20	14.26	1.23	1.31	260	.....	.....	E	45	S	58	52	.....	10	20
580	...do.....	82.79	13.60	2.27	1.34	700	.....	.....	I	75	M	56	56	.....	15	16
581	...do.....	82.99	13.23	2.66	1.12	540	25	.....	B	45	S	56	62	3	2	27
583	...do.....	80.96	13.88	3.74	1.42	948	.....	.....	I	200	L	56	56	.....	7	20
585	October...	80.90	14.59	2.98	1.53	640	28	.60	B	35	L	58	56	5	2	25
587	September	80.29	14.45	3.27	1.99	.....	.....	.40	B	50	L	56	66	.....	12	18
589	...do.....	81.24	14.21	3.29	1.26	614	.....	.....	I	70	M	56	56	2	8	19
590	...do.....	81.34	13.82	3.81	1.03	.....	.....	.30	B	50	L	60	66	.....	12	18
591	...do.....	81.79	13.82	3.31	1.08	445	27	.60	B	17	L	61	56	7	.....	20
592	November	84.74	12.58	1.77	.91	654	26	.....	B	70	S	59	60	.....	12	20
593	September	83.65	13.61	1.18	1.56	118	35	.62	B	40	S	60	61	.....	20	14
594	October...	84.71	13.78	.82	.69	62	34	.60	B	35	S	61	62	.....	18	16
615	April.....	85.92	11.45	2.40	.23	945	25	.....	B	45	S	62	52	.....	12	9
616	...do.....	85.43	12.02	1.69	.86	630	20	.....	B	30	L	61	61	.....	12	13
618	...do.....	83.34	12.82	2.84	1.00	450	.....	.....	B	45	S	54	54	.....	4	28
619	...do.....	85.75	11.90	1.50	.85	548	.....	.....	B	40	M	60	58	.....	10	28
620	...do.....	85.21	11.65	2.35	.79	352	.....	.....	B	35	M	58	46	25	.....	25
621	...do.....	84.22	13.22	1.83	.73	184	.....	.....	C	30	S	59	60	20	.....	20
622	November	82.75	14.44	1.41	1.40	168	29	.....	I	45	S	57	63	.....	20	25
623	May.....	83.88	12.72	3.10	.30	568	43	.....	B	40	M	55	58	.....	12	32
624	April.....	82.85	13.81	2.47	.87	449	.....	.....	I	30	M	58	60	8	.....	16
625	...do.....	84.11	13.67	1.04	1.18	599	.....	.....	E	45	S	58	58	.....	3	28
626	...do.....	86.32	10.76	2.22	.70	409	.....	.....	B	.....	S	52	60	.....	16	24
628	October...	85.58	11.04	2.37	1.01	115	.....	.....	G	35	S	58	67	.....	6	14

[1] One day's make, several churnings.

TABLE I.—*Detailed analyses of samples of American creamery butter*—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Churning temperature.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers in gear.	Rollers out of gear.	
		Per ct.	*Per ct.*	*P. ct.*	*P. ct.*	*Lbs.*	*P. ct.*	*P. ct.*		*Mins.*		*° F.*	*° F.*			
630	October...	84.30	12.34	1.03	2.33	465	28½	.....	I	50	S	61	65	....	4	16
631	April.....	83.34	13.90	2.24	.52	133	24	.....	I	25	S	62	60	....	8	16
632	October...	82.79	14.51	1.65	1.05	330	.....	.....	I	45	L	58	75	....	8	14
633	February.	80.76	14.38	3.66	1.20	800	28	.....	B	45	L	58	64	....	15	20
634	December.	81.48	14.71	2.55	1.26	840	36	.....	G	45	M	53	53	....	56	20
635	January...	81.82	14.22	2.90	1.06	.....	29	.....	G	90	M	57	58	10	8	8
637	...do.....	79.55	15.72	2.73	2.00	1,050	29	.....	G	35	....	63	58	8	7	14
639	December.	81.66	14.52	2.45	1.37	791	32	.....	G	40	M	52	52	....	56	15
640	January...	81.39	15.02	2.30	1.29	860	.....	.....	H	.....	....	58	61	....	75	40
643	April.....	84.16	11.55	2.30	1.99	340	.....	.....	E	30	S	60	60	....	25	16
644	...do.....	82.99	12.96	2.18	1.87	1,030	.....	.....	B	60	S	57	56	....	16	30
645	December.	83.89	12.60	2.02	1.49	312	24	.....	B	30	M	60	60	....	34	35
646	...do.....	82.88	13.33	2.59	1.20	553	23	.....	B	45	M	61	60	....	25	35
647	...do.....	81.88	13.79	2.27	2.06	645	25	.....	B	47	S	61	59	....	34	45
648	April.....	83.98	12.28	3.13	.61	650	.....	.....	I	60	S	60	62	....	22	12
649	October...	81.97	14.37	3.02	1.64	550	.....	.....	I	60	M	56	56	....	....	....
650	...do.....	81.26	13.46	4.04	1.24	786	.....	.....	I	60	S	56	58	....	12	14
651	...do.....	81.02	14.72	3.25	1.01	746	.....	.....	I	60	M	50	55	....	12	....
652	...do.....	83.23	13.68	2.01	1.08	533	.....	.....	I	60	L	52	56	....	15	17
653	...do.....	83.74	13.49	1.51	1.26	214	.....	.....	I	40	M	54	56	....	16	14
654	...do.....	84.08	12.60	2.07	1.29	520	27	.....	I	60	M	55	55	....	10	18
656	September.	82.96	13.72	1.72	1.60	.....	.....	.....	I	45	S	56	56	....	10	4
657	...do.....	82.80	14.27	1.72	1.21	530	.....	.....	I	42	S	54	55	2	8	12
658	...do.....	84.09	13.59	1.06	1.26	478	26½	.....	D	60	M	56	56	....	6	14
659	October...	82.60	13.39	2.08	1.73	587	22	.....	I	40	S	55	53	6	....	10
660	...do.....	80.79	13.78	4.20	1.23	567	.....	.....	I	40	M	53	53	....	....	12
662	September	82.57	15.73	2.43	1.07	203	28	0.00	I	28	S	56	55	....	10	16
666	April.....	82.92	12.91	3.50	.67	275	.....	.....	I	30	M	62	64	....	15	12
668	...do.....	84.72	11.87	2.13	1.28	.....	.....	.....	I	20	M	61	65	....	6	14
669	March.....	80.35	15.19	3.68	.78	497	30	.....	E	30	M	54	56	10	5	26
670	April.....	83.79	13.05	2.50	.66	375	32	.....	I	25	M	58	60	....	15	12
671	May.....	82.98	11.90	1.72	1.07	140	.....	.....	G	55	S	51	56	....	8	25
673	...do.....	81.84	14.62	2.60	.94	.....	.....	.80	I	30	S	58	50	....	5	....
674	January..	83.62	13.85	1.42	1.11	315	30	.....	I	20	S	64	66	....	6	4
675	May.....	77.95	17.28	3.83	.94	493	32	.56	I	30	M	62	56	....	4	14
678	April.....	84.36	13.16	1.63	.85	700	.....	.....	B	60	S	56	56	....	12	30
679	...do.....	81.68	14.46	2.56	1.30	598	.....	.....	E	60	S	54	56	....	7	22
680	November	81.58	14.11	2.96	1.35	673	25½	.....	B	40	M	58	60	....	14	25
681	April.....	84.13	12.44	2.76	.67	232	.....	.54	B	30	S	50	56	21	....	32
682	...do.....	85.49	12.20	1.37	.94	471	.....	.....	B	30	M	58	60	10	....	30
683	...do.....	85.03	12.91	1.77	.29	670	.....	.....	B	40	....	60	58	....	10	24
684	December.	81.88	13.74	2.83	1.57	718	24	.....	B	120	M	61	60	....	40	42
685	April.....	83.45	13.54	1.85	1.16	945	25	.....	B	45	S	62	52	....	12	9
686	October...	82.49	13.20	3.07	1.24	372	26	.65	B	40	S	58	60	....	8	25
687	...do.....	82.75	13.75	2.50	1.00	550	33	.55	I	50	M	55	57	....	20	15
688	...do.....	78.22	16.97	3.33	1.48	264	25	.65	B	40	M	58	62	....	15	15
689	...do.....	81.92	13.64	3.27	1.17	846	29	.58	I	45	L	56	54	....	10	18
690	...do.....	83.27	13.03	3.03	1.17	160	22	.70	I	55	M	56	60	....	30	15
691	...do.....	85.05	12.87	1.30	.78	106	28	.60	I	20	S	58	60	....	10	12
692	...do.....	81.17	13.32	4.30	1.21	770	33	.....	B	40	M	57	60	....	10	28
693	...do.....	82.51	14.35	1.48	1.66	740	30	.60	I	60	M	58	54	....	6	14
694	...do.....	81.83	14.89	2.12	1.16	392	33	.75	I	30	S	57	68	....	4	18
695	...do.....	84.69	12.42	1.76	1.13	315	26	.55	B	40	M	59	56	....	6	20
696	March.....	78.40	15.80	4.62	1.18	318	.....	.....	E	40	S	56	53	....	12	44
697	February.	83.87	12.80	2.38	.95	775	.....	.....	B	35	L	62	61	....	16	26
698	...do.....	81.27	15.26	2.42	1.05	600	.....	.....	I	60	M	60	64	....	12	25
700	...do.....	81.28	15.56	2.48	.68	740	.....	.....	I	60	L	61	58	....	13	14
701	January...	79.27	16.17	3.41	1.15	725	31	.....	I	90	L	59	60	12	40	25
702	...do.....	82.44	13.64	2.94	.98	177	26½	.59	G	40	L	58	60	....	10	20
704	...do.....	83.96	12.45	2.83	.76	319	28	.51	C	45	M	56	56	....	20	30
705	February.	84.56	11.84	2.60	1.00	400	.....	.....	B	45	M	58	58	....	15	....
706	November	81.21	13.18	4.71	.90	308	30	.....	I	60	M	58	60	....	15	18
707	April.....	82.11	14.75	2.21	1.93	386	30	.50	B	30	S	58	60	....	15	28
708	November	79.45	15.55	3.46	1.54	680	20	.....	I	120	M	52	57	....	8	11
710	...do.....	82.74	13.10	2.89	1.27	670	22	.....	E	.....	....	56	58	....	14	....
711	...do.....	80.61	15.10	3.38	.91	400	.....	.....	I	50	M	56	60	....	8	....
712	...do.....	84.79	10.93	2.38	1.90	314	.....	.....	I	105	L	56	54	....	10	10
713	...do.....	84.64	12.80	1.41	1.15	750	.....	.....	G	30	M	62	63	....	6	....
716	...do.....	82.90	11.90	4.12	1.18	428	32	.49	A	60	S	52	56	....	....	....
717	December.	80.48	15.92	1.70	1.90	183	17	.....	G	35	M	62	60	....	12	....
723	January...	82.18	14.57	1.89	1.36	648	27	.52	B	40	S	62	68	....	15	29
724	...do.....	83.03	13.07	2.45	1.45	395	28	.52	B	35	L	64	64	....	12	24

TABLE I.—*Detailed analyses of samples of American creamery butter*—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.		Size of granules.	Churning temperature of wash water.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.										Rollers in gear.	Rollers out of gear.	
		Per ct.	*Per ct.*	*P. ct.*	*P. ct.*	*Lbs.*	*P. ct.*	*P. ct.*		*Mins.*			*° F.*	*° F.*			
725	November	81.47	12.94	4.57	1.02	569	30	.....	E	80	M		56	62	....	9	26
726	...do.....	83.68	12.72	1.98	1.62	327	35	0.50	I	35	M		56	58	....	6	19
727	...do.....	83.16	13.09	1.89	1.86	324	27	.60	I	55	S		56	56	....	15	10
728	January...	83.80	12.15	2.95	1.10	468	30	.55	B	85	S		58	60	....	6	28
729	...do.....	82.70	13.08	2.17	2.05	280	30	.50	B	40	S		56	66	....	8	28
730	November	86.36	12.02	.68	.94	218	28	.58	E	60	M		62	62	....	12	15
731	...do.....	84.73	12.48	1.70	1.09	127	31	.65	B	65	S		55	58	....	30	30
732	...do.....	83.31	13.44	1.77	1.48	432	27	.50	B	60	M		59	57	....	6	16
733	...do.....	80.76	15.32	2.48	1.44	150	25	.51	C	64	S		59	62	....	25	30
734	...do.....	83.62	12.98	2.07	1.33	782	27	.....	I	75	M		57	58	....	25	18
735	...do.....	84.12	12.73	2.03	1.12	284	30	.....	I	45	M		56	60	....	10	15
736	January...	83.30	13.48	1.93	1.29	522	23	.57	B	48	M		55	57	....	4	18
737	December.	82.91	13.23	2.82	1.04	975	28	.55	B	40	L		62	62	....	8	29
738	November	81.45	15.14	2.22	1.19	133	28	.52	C	35	M		61	61	....	15	32
739	...do.....	82.35	13.93	2.33	1.39	160	24	.21	I	45	S		62	62	....	15	18
740	December.	82.38	13.80	2.80	1.02	149	29	.53	C	25	S		58	60	....	10	25
741	November	82.39	13.82	2.85	.54	145	22	.56	C	40	L		60	58	....	15	25
742	...do.....	78.77	14.77	5.65	.81	266	27½	.25	E	30	M		60	60	....	10	23
743	...do.....	80.16	15.76	2.29	1.79	198	22½	.62	E	70	S		62	62	....	15	17
744	January...	84.42	12.18	2.43	.97	330	27	.50	E	30	S		60	65	....	25	24
745	December.	81.67	13.99	3.36	.98	230	28	.59	I	38	S		58	63	....	24	24
746	...do.....	83.83	12.63	2.62	.92	685	25	.....	B	55	S		60	56	....	12	24
747	...do.....	82.47	13.66	2.09	1.78	256	.....	.....	I	35	S		57	63	....	28	33
748	...do.....	81.18	13.68	3.66	1.48	249	27	.43	I	47	S		56	63	....	24	31
749	...do.....	81.07	13.93	2.30	2.70	230	28	.50	I	40	L		58	63	....	30	35
750	...do.....	80.72	15.70	1.95	1.63	429	.....	.....	I	120	M		59	59	10	.....	10
751	...do.....	80.24	15.16	3.81	.79	750	.....	.....	I	130	M		55	58	15	.....	18
752	...do.....	77.77	15.52	5.25	1.46	785	.....	.58	I	60	M		60	59	8	.....	14
753	...do.....	82.79	13.37	2.25	1.69	620	.....	.....	B	60	S		54	65	....	12	....
754	...do.....	82.17	14.38	2.19	1.26	720	.....	.....	I	45	S		56	68	....	16	13
756	...do.....	83.47	12.51	2.60	1.42	386	26	.....	I	45	S		54	60	....	11	12
757	...do.....	82.54	14.00	2.29	1.17	680	26	.....	I	30	M		60	60	....	12	11
758	...do.....	80.49	14.59	3.08	1.84	490	.....	.....	I	75	M		56	66	....	14	14
759	...do.....	80.20	15.49	2.94	1.37	275	.....	.....	I	24	M		60	62	9	.....	14
760	...do.....	80.72	14.07	3.90	1.31	835	27	.....	I	40	M		60	58	5	.....	18
761	...do.....	82.32	11.56	4.76	1.36	246	.....	.....	I	60	M		60	62	....	10	9
762	February	82.83	12.36	3.63	1.18	310	29	.50	I	25	S		55	61	....	10	10
763	January...	84.11	13.37	1.47	1.05	209	28	.54	B	45	S		56	63	....	10	27
764	February	80.33	14.15	4.36	1.16	454	26	.58	I	40	M		56	66	....	20	18
765	March....	84.02	12.33	2.44	1.21	242	28	.60	I	30	S		62	60	....	10	16
766	February	84.11	12.28	2.97	.64	567	29	.50	B	35	M		61	63	6	.....	28
767	May.....	84.83	12.72	1.57	.88	541	29	.....	B	25	S		58	60	....	12	18
768	February	80.94	14.81	3.25	1.00	398	30	.....	D	40	M		60	62	....	15	21
769	March....	81.60	14.94	1.45	1.99	435	.55	B	30	M		60	62	....	14	25	
770	February	80.41	16.23	2.15	1.21	791	29	.60	E	40	M		60	59	12	.....	15
771	...do.....	84.13	13.07	2.16	.64	407	27½	.....	B	40	S		55	60	....	10	25
773	March....	83.10	14.25	2.01	.64	220	.....	.....	I	90	S		60	60	....	7	16
775	...do.....	84.86	13.22	1.35	.57	336	30	.....	I	30	M		60	50	4	3	12
776	...do.....	81.93	15.35	2.15	.57	2,311	.....	.....	I	30	S		56	57	....	20	20
777	...do.....	83.39	13.36	1.75	1.50	980	33	.....	G	30	M		58	59	....	40	12
778	...do.....	83.47	13.84	2.04	.65	618	26	.35	I	40	M		58	58	.....	.....	10
779	...do.....	81.95	15.54	1.73	.78	217	.....	.....	G	25	L		62	60	5	20	....
780	...do.....	81.95	14.30	2.80	.95	700	.....	.....	G	60	M		50	54	6	8	10
781	...do.....	82.45	14.05	2.15	1.35	750	26	.75	I	75	M		57	53	....	5	48
782	...do.....	83.29	13.54	1.57	.60	600	.....	.....	G	50	S		58	58	....	.....	14
784	...do.....	73.49	20.65	5.14	.72	600	30	.....	G	60	S		50	64	....	4	....
785	May.....	81.80	15.41	1.65	1.14	500	35	.55	G	50	M		56	56	....	14	16
786	March....	85.72	11.10	2.38	.80	750	35	.....	G	60	S		57	56	....	10	....
787	...do.....	82.21	15.08	2.22	.49	520	28	.....	B	40	M		50	56	15	.....	25
788	...do.....	82.81	14.78	1.65	.76	850	31	.....	B	75	L		54	56	....	.....	25
790	...do.....	79.68	16.38	3.03	.91	2,000	28	.....	G	45	M		59	57	.....	.....	15
791	April....	81.12	15.55	2.43	.90	280	33	.....	I	40	L		60	58	....	8	20
792	March....	83.97	14.22	1.34	.47	323	.....	.....	G	30	L		56	55	....	35	20
793	April....	84.51	13.34	1.53	.62	1,037	36	.....	I	30	S		60	62	....	12	....
794	March....	82.08	15.72	2.75	.45	825	30	.....	G	75	M		55	50	....	112	12
795	...do.....	80.98	14.20	2.81	1.01	650	30	.....	G	45	M		58	54	....	15	....
798	June.....	83.13	13.83	1.90	1.14	380	25½	.....	B	30	S		59	62	....	12	24
799	April....	84.28	13.71	1.22	.79	274	30	.58	I	10	M		64	64	....	5	15
800	May.....	81.45	15.11	2.13	1.31	1,610	25	.....	B	35	M		55	53	....	6	23
801	April....	84.08	13.72	1.86	.34	1,256	.....	.50	B	40	M		55	60	....	25	25
802	May.....	83.69	12.72	2.52	.97	321	25	.....	B	19	M		56	60	....	5	24
803	April....	83.24	13.52	2.21	1.03	545	28	.56	B	35	M		56	60	....	25	20

TABLE I.—*Detailed analyses of samples of American creamery butter*—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.								Rollers in gear.	Rollers out of gear.	
		Per ct.	*Per ct.*	*P. ct.*	*P. ct.*	*Lbs.*	*P. ct.*	*P. ct.*		*Mins.*		° *F.*	° *F.*		
804	May.....	83.69	12.69	2.29	1.34	648	25	0.60	I	45	S	56	56	....	20	12
805	April.....	85.62	11.82	1.46	1.10	568	25	.60	I	40	S	60	68	....	50	16
806	May.....	81.31	14.39	2.91	1.39	307	27	.60	I	30	M	58	56	....	15	16
807	April.....	84.33	13.74	.99	.94	336	28	.60	I	30	M	59	62	....	10	14
808	May.....	82.82	14.44	1.52	1.22	658	28	.56	B	30	M	58	62	....	15	25
809	April.....	82.58	13.52	3.09	.81	789	26	.....	I	60	M	56	68	....	30	25
810	...do.....	81.73	14.07	3.35	.83	380	25	.33	E	50	S	55	56	....	14	30
811	...do.....	85.40	10.72	3.06	.82	374	24	.....	I	95	S	58	60	....	10	26
812	...do.....	83.47	14.16	1.28	1.09	550	24	.....	I	30	M	58	58	....	8	16
813	May.....	80.06	15.57	3.26	1.11	475	22	.....	B	35	S	56	49	....	6	26
814	...do.....	81.52	14.97	2.44	1.07	800	30	.59	I	25	M	54	50	2	....	11
815	...do.....	84.08	13.19	1.65	1.08	431	22	.....	E	30	M	54	54	....	12	18
816	June.....	81.13	14.91	2.80	1.16	700	30	.....	I	45	M	50	52	7	....	10
817	May.....	82.81	14.16	1.64	1.39	383	29	.....	B	25	M	58	52	....	18	40
818	April.....	84.83	13.51	1.13	.53	450	25	.....	I	35	M	54	52	....	16	9
819	June.....	80.81	14.85	3.93	.41	591	.....	.....	I	45	M	60	54	4	14	14
820	May.....	81.59	15.88	2.05	.57	600	32	.....	I	45	S	51	54	....	8	14
823	...do.....	83.09	13.49	2.71	.71	500	27	.....	B	35	M	58	56	....	13	26
824	June.....	80.69	16.14	2.04	1.13	870	32	.....	E	40	L	52	54	....	12	21
825	...do.....	80.84	15.24	2.71	1.21	750	32	.....	I	70	L	52	50	....	6	10
826	May.....	82.36	14.18	2.35	1.11	441	23	.....	I	45	S	55	51	....	11	11
827	June.....	78.14	15.12	5.96	.78	1,075	30	.....	E	40	L	58	50	....	14	34
828	May.....	82.39	14.25	2.08	1.37	504	29	.....	I	35	M	54	52	....	8	11
829	April.....	80.80	14.37	3.94	.89	618	24	.....	B	40	M	58	58	6	....	30
830	...do.....	82.15	14.78	2.26	.81	663	23	.50	I	60	M	57	56	29	....	24
831	May.....	82.48	13.94	2.26	1.32	660	32	.64	I	60	M	53	53	....	2	12
832	...do.....	83.49	15.06	.94	.51	350	.....	.....	I	50	L	53	50	5	3	14
834	...do.....	83.57	13.71	1.67	1.05	840	23	.....	I	40	M	56	56	9	....	18
835	...do.....	83.74	14.10	1.45	.71	1,488	22	.....	I	40	M	55	52	7	....	16
843	...do.....	86.08	11.47	1.55	.90	308	.....	.....	I	45	M	58	60	....	7	20
852	March.....	84.37	13.09	2.34	.20	373	24	.....	I	45	M	56	58	....	15	20
854	...do.....	82.52	13.50	3.23	.75	475	24	.50	I	35	M	55	56	....	7	15
862	April.....	83.03	13.92	2.19	.86	242	33	.....	B	30	M	54	65	....	7	33
869	March.....	84.16	14.26	1.19	.39	567	30	.57	B	75	S	51	56	3	....	23
870	May.....	82.65	14.92	1.47	.96	471	28	.54	B	30	L	52	60	20	....	35
873	...do.....	79.24	15.48	4.02	1.26	640	25	.54	I	40	S	54	54	....	15	9
876	April.....	78.80	15.66	4.13	1.41	525	32	.....	I	30	L	60	60	3	.....	18
878	...do.....	84.77	12.66	1.49	1.08	669	31	.....	I	50	M	59	60	2	.....	12
879	...do.....	83.74	14.65	1.39	1.05	562	29	.66	B	40	M	57	62	5	10	....
882	...do.....	82.42	14.31	2.25	1.02	763	27	.....	I	40	L	56	58	....	9	16
910	June.....	82.77	13.86	2.30	1.07	1,851	24	.....	B	45	S	56	56	....	7	17
914	May.....	80.44	15.12	2.61	1.83	496	.....	.....	B	80	S	58	58	....	10	24
917	April.....	82.25	12.65	3.83	1.27	785	.....	.....	B	55	S	61	57	....	16	25
923	...do.....	78.91	17.13	2.31	1.65	603	27	.....	I	70	S	56	52	9	.....	25
924	...do.....	83.27	14.19	1.54	.70	451	25	.....	E	40	M	55	64	....	6	18
925	June.....	84.07	12.81	2.63	.49	632	25	.....	B	45	M	54	54	....	5	25
926	...do.....	82.23	14.84	2.20	.73	615	26	.....	E	40	M	52	52	....	10	20
928	July.....	82.57	14.38	2.51	.54	256	29	.....	B	35	M	58	60	11	.....	27
929	April.....	80.52	14.73	3.85	.90	953	26	.....	B	65	S	58	62	....	16	33
930	...do.....	83.18	13.73	1.57	1.52	333	29	.....	I	45	M	54	59	....	3	15
931	May.....	83.78	13.53	1.73	.96	640	24	.....	B	45	M	53	48	....	8	28
935	...do.....	83.88	13.90	1.34	.88	628	.....	.....	D	30	M	56	60	....	6	30
936	April.....	84.02	13.12	1.80	1.06	179	.....	.....	B	40	S	56	52	....	5	25
939	June.....	82.67	14.21	2.08	1.04	1,000	.....	.63	B	60	M	54	50	....	10	25
940	April.....	81.39	13.80	4.13	.88	350	.....	.....	B	30	M	56	53	20	....	40
942	...do.....	83.65	13.38	2.04	.93	399	.....	.....	B	30	M	56	60	10	....	25
944	June.....	84.45	11.72	3.19	.64	292	35	.45	I	50	S	53	59	....	4	26
952	May.....	82.31	14.22	2.17	1.30	855	24	.....	C	80	M	57	57	....	6	....
953	July.....	81.93	14.49	3.04	.54	672	35	.45	I	45	M	51	62	20	.....	15
958	...do.....	81.64	14.66	2.73	.97	920	38	.60	I	45	M	54	58	....	10	30
960	...do.....	83.67	14.38	1.29	.66	270	35	.....	C	45	M	54	53	....	7	22
991	April.....	82.53	14.50	1.91	1.06	1,136	24	.....	B	40	M	57	59	....	8	23
1041	...do.....	81.36	14.42	2.78	1.44	415	29	.50	G	50	S	54	52	....	10	18
1044	...do.....	83.51	12.47	3.25	.77	315	31	.....	G	20	M	54	54	....	6	23
1050	...do.....	85.64	11.72	1.51	1.13	594	40	.....	G	33	M	53	56	....	5	25
1052	...do.....	80.91	15.31	2.25	1.53	364	44	.....	G	20	M	60	64	....	3	30
1058	...do.....	83.55	12.85	2.42	1.18	504	.....	.....	G	30	M	60	52	....	5	18
1059	...do.....	81.24	15.03	2.40	1.33	500	27	.58	I	35	S	54	53	....	10	24
1060	...do.....	83.66	12.66	2.78	.90	385	.....	.....	B	65	S	49	56	....	9	20
1066	...do.....	83.92	12.86	1.77	1.45	654	30	.55	B	30	S	58	58	....	10	32
1070	...do.....	84.07	11.98	2.23	1.72	900	.....	.55	G	48	S	54	58	....	6	19
1072	...do.....	84.12	13.21	1.35	1.32	456	20	.....	E	60	S	61	59	....	6	16

TABLE I.—*Detailed analyses of samples of American creamery butter*—Continued.

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.	Churning temperature.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers in gear.	Rollers out of gear.	
		Per ct.	*Per ct.*	*P. ct.*	*P. ct.*	*Lbs.*	*P. ct.*	*P. ct.*		*Mins.*		°*F.*	°*F.*			
1073	April	84.19	13.42	1.37	1.02	699	.....	0.57	G	30	S	57	53	....	5	15
1077	do	83.26	13.46	1.83	1.45	694	38	.54	G	55	S	54	59	....	8	15
1078	do	79.88	14.73	4.74	.65	322	.....	.....	B	60	S	60	58	....	6	28
1080	do	84.06	13.34	1.72	.88	586	.....	.50	I	32	S	56	58	....	3	12
1082	do	85.11	12.33	1.85	.71	4.0	35	.50	I	35	S	54	54	....	25	14
1084	do	79.77	16.88	2.75	.60	434	.....	.....	B	30	S	58	60	....	12	24
1086	do	84.56	12.61	1.40	1.43	653	24	.70	B	45	S	55	58	....	9	19
1087	do	82.80	13.22	3.00	.98	822	36	.....	I	25	S	58	50	....	12	25
1089	do	84.73	12.49	1.87	.91	348	35	.....	.....	30	S	60	54	....	8	30
1091	do	82.66	13.80	2.55	.99	625	19	.48	I	30	S	53	54	6	.....	16
1092	May	83.26	13.53	2.05	1.16	800	21	.....	I	40	S	57	54	....	6	.....
1093	do	83.30	13.48	2.32	.90	756	.....	.....	I	40	M	56	60	....	12	8
1094	do	81.83	13.73	3.10	1.34	468	26	.....	I	45	M	56	56	....	8	14
1095	April	86.09	11.23	1.90	.78	515	.....	.....	I	45	M	58	56	....	15	12
1096	do	83.50	12.59	3.20	.71	496	26	.....	I	30	S	58	60	....	12	18
1098	do	83.50	13.29	2.28	.93	780	25	.....	I	35	M	60	55	....	18	14
1101	do	86.24	10.52	2.27	.97	620	.....	.....	G	35	S	61	55	....	5	.....
1102	do	85.88	11.84	1.52	.76	.....	.....	.....	I	45	M	56	58	....	10	.....
1105	do	83.76	14.35	2.08	.81	285	.....	.....	G	45	M	58	54	....	8	17
1106	do	81.45	14.19	3.28	1.08	670	26	.....	I	240	M	58	54	....	6	17
1107	do	80.59	15.07	3.24	1.10	60	28	.....	I	45	S	58	55	....	2	12
1109	do	85.16	11.75	2.05	1.04	200	.....	.....	I	45	L	56	52	....	6	.....
1110	do	81.62	14.74	2.62	1.02	600	.....	.....	E	75	.....	54	59	....	12	21
1111	May	84.90	11.56	2.36	1.24	725	32	.....	G	55	S	60	50	....	4	16
1112	do	80.90	16.47	2.01	.62	282	.....	.....	G	30	M	64	56	....	8	.....
1113	do	79.89	15.16	4.02	.93	700	35	.....	I	30	M	56	56	5	5	32
1114	do	83.62	12.69	2.87	.82	600	30	.....	G	45	M	59	57	....	40	36
1115	do	83.30	13.72	2.27	.71	400	35	.....	G	30	M	58	.....	....	5	30
1116	do	82.78	13.69	2.23	1.30	475	30	.....	I	45	M	58	58	....	12	.....
1117	June	83.09	12.85	2.13	.96	800	30	.....	G	60	M	58	58	....	2	10
1118	May	82.61	14.03	2.32	1.04	492	26	.....	G	50	M	58	62	....	.....	23
1119	do	81.76	13.75	3.26	1.23	578	33	.....	G	60	M	57	59	....	62	12
1123	do	83.55	13.34	2.17	.94	384	33	.....	G	45	S	52	54	....	7	30
1124	April	82.86	13.24	2.67	1.23	1,672	31	.60	G	60	S	56	58	15	.....	25
1126	May	82.83	13.17	1.56	.44	348	30	.....	B	45	M	59	60	....	32	8
1127	do	83.59	12.15	3.35	.91	700	30	.50	I	35	S	61	62	....	10	12
1128	do	85.92	10.66	2.25	1.17	460	32	.....	G	60	S	60	56	....	15	26
1129	do	83.02	13.43	2.42	1.13	430	.....	.....	G	30	S	60	56	....	10	30
1130	April	78.29	18.65	1.96	1.10	1,912	31	.60	G	60	M	58	58	....	.....	12
1131	May	79.85	15.10	3.84	1.21	580	22	.....	E	30	S	54	56	....	15	22
1132	do	84.47	13.35	1.30	.88	380	27	.....	I	45	S	55	56	....	7	9
1133	do	80.11	14.55	4.52	.82	475	20	.....	I	50	S	58	53	....	20	18
1136	do	82.98	12.30	4.05	.67	540	.....	.....	I	45	S	56	60	....	10	12
1137	do	82.09	13.94	2.73	1.24	500	.....	.....	I	45	M	56	58	....	10	18
1138	April	86.73	10.52	1.85	.85	596	25	.....	B	75	M	58	56	....	14	.....
1139	May	83.40	13.03	2.75	.82	690	25	.....	B	45	M	55	58	....	18	24
1140	do	84.72	13.09	1.96	.23	760	25	.....	B	45	M	57	60	....	8	22
1141	do	83.23	13.93	1.95	.89	756	28	.....	B	45	M	60	59	....	10	28
1142	do	83.31	13.29	2.61	.79	495	20	.52	I	45	S	58	58	....	11	10
1143	June	84.02	13.60	1.88	.50	700	35	.....	I	50	M	58	60	....	11	10
1145	do	84.19	13.47	2.01	.33	500	30	.....	B	30	M	55	55	11	.....	25
1147	do	82.94	13.33	2.59	1.14	120	32	.....	G	25	M	58	58	....	20	16
1154	do	86.56	11.64	1.34	.46	667	.....	.....	G	30	S	54	51	....	8	21
1155	do	83.44	13.05	2.66	.85	435	28	.....	G	45	S	58	58	....	20	12
1157	do	80.29	15.55	3.30	.86	592	.....	.....	G	25	M	58	60	....	33	17
1158	July	83.23	14.01	1.70	1.06	820	30	.....	G	.....	S	56	67	....	10	.....
1160	June	79.75	16.39	3.19	.67	750	.....	.....	B	60	M	56	57	....	11	10
1161	do	82.34	13.19	3.68	.79	360	33	.55	G	60	M	58	58	16	3	30
1163	April	83.13	14.00	1.54	1.33	199	21	.....	B	18	M	60	62	16	.....	20
1164	May	82.25	14.53	1.34	.88	800	.....	.....	E	30	S	57	50	....	10	22
1165	do	82.05	12.95	4.52	.48	631	25	.....	B	35	S	56	54	....	6	18
1175	April	83.58	12.05	3.55	.82	225	21	.....	B	40	S	56	56	3	6	24
1190	July	80.26	15.73	3.14	.87	661	30	.50	B	45	M	56	55	8	5	15
1193	do	83.42	14.13	1.92	.53	116	26	.....	G	50	S	52	53	....	3	14
1194	May	81.52	13.00	4.21	1.27	372	31	.....	I	18	L	58	58	....	6	9
1195	June	80.90	14.48	3.44	1.18	307	25	.....	B	22	L	60	58	....	6	32
1198	July	84.17	12.93	2.42	.48	185	25	.....	C	45	M	56	56	....	35	120
1205	June	82.11	14.93	2.30	.66	590	31	.....	C	45	M	55	55	5	.....	24
1206	July	83.04	13.39	3.10	.47	863	29	.....	I	45	L	58	54	....	12	12
1207	do	81.06	14.66	3.44	.82	726	24	.....	I	45	M	56	56	....	15	14
1208	June	82.50	14.89	1.40	1.21	1,362	30	.....	I	40	M	55	52	....	3	18
1209	do	82.46	14.70	2.54	.30	620	25	.....	B	40	M	53	52	....	4	22

TABLE II.—*Detailed analyses of samples of Navy butter.*

Number of sample.	Month taken.	Composition.				Amount of butter made.	Test of cream.	Acidity of cream.	Kind of churn used.	Churning time.	Size of granules.[1]	Churning temperature.	Temperature of wash water.	Revolutions in wash water.		Revolutions worked.
		Butterfat.	Moisture.	Salt.	Curd.									Rollers in gear.	Rollers out of gear.	
		Per ct.	*Per ct.*	*P. ct.*	*P. ct.*	*Lbs.*	*P. ct.*	*P. ct.*		*Mins.*		*° F.*	*° F.*			
46	July	83.31	13.06	2.62	1.01	1,610	35	0.15	G	60	M	48	42	....	6	16
48	...do	83.63	12.86	2.46	1.05	936	34	.19	G	60	S	46	42	....	6	16
49	...do	83.17	13.09	2.61	1.13	864	34	.19	G	45	M	48	44	....	7	18
51	...do	82.90	13.03	2.95	1.12	760	29	.19	G	60	M	48	44	....	7	16
52	...do	83.30	12.76	3.01	.93	730	33	.19	G	40	M	50	42	....	6	15
53	...do	84.04	12.57	2.64	.75	940	33	.18	G	50	M	50	42	....	8	16
56	August	84.84	11.46	2.87	.83	1,660	29	.14	D	60	S	52	46	....	12	20
64	...do	84.73	11.82	2.68	.77	1,687	28	.14	D	40	S	52	46	....	12	25
65	July	83.35	12.63	2.56	1.46	1,333	27	.16	D	50	S	52	46	....	12	20
80	August	84.89	11.32	2.41	1.38	1,846	28	.17	D	75	S	52	46	....	12	20
128	July	83.81	12.83	2.49	.87	1,656	33	.16	G	45	M	50	46	....	4	16
129	...do	82.97	13.01	2.88	1.14	756	33	.16	G	50	M	48	42	....	6	17
131	...do	84.40	12.12	2.96	.52	1,554	31	.21	G	50	S	48	42	....	4	16
133	...do	83.51	11.84	2.84	1.81	1,822	28	.15	D	45	S	51	46	....	12	25
134	...do	84.75	11.66	3.11	.48	1,561	27	.19	D	40	S	52	46	....	12	20
135	...do	85.18	11.19	2.95	.68	1,785	28	.18	D	40	S	51	46	....	12	20
136	...do	84.62	11.97	2.81	.60	1,748	29	.14	D	40	S	51	46	....	12	20
149	...do	83.62	12.75	2.95	.68	574	.....	.14	B	30	L	53	49	....	10	26
150	...do	83.10	12.92	3.18	.80	660	.....	.14	B	30	L	56	49	....	10	26
151	...do	84.33	12.20	2.71	.76	520	.....	.15	B	45	L	52	49	....	10	25
187	...do	84.37	12.50	2.38	.75	.....	.....	.12	B	60	L	52	49	....	10	30
188	...do	84.41	11.95	2.02	1.62	.....	.....	.15	B	45	L	52	48	....	10	28
189	...do	84.36	12.14	2.87	.63	.....	.....	.15	B	45	L	52	48	....	12	26
190	...do	83.60	12.31	3.09	1.00	520	.....	.15	B	45	L	52	49	....	10	28
223	...do	83.55	12.31	2.91	1.23	525	.....	.14	B	45	L	53	50	....	10	29
224	August	84.06	12.20	3.07	.67	300	.....	.14	B	45	L	52	49	....	10	26
225	...do	84.85	11.33	2.70	1.12	450	.....	.13	B	60	L	52	50	....	12	27
227	...do	84.96	11.59	2.53	.92	480	.....	.26	B	120	L	50	50	....	10	28
356	...do	83.59	12.36	2.91	1.14	406	.....	.31	B	60	S	54	48	....	10	25
357	...do	83.79	12.40	2.99	.82	455	.....	.14	I	120	M	51	48	....	10	14
358	...do	85.38	11.53	2.33	.76	420	.....	.13	B	45	L	52	48	....	10	26
359	...do	85.01	11.53	2.46	1.00	450	.....	.13	B	60	L	50	50	....	12	33
368	...do	85.46	11.49	2.14	.91	650	.....	.15	B	120	M	51	48	....	10	26
1201	July	84.16	12.70	2.48	.66	1,278	43	.18	G	50	M	55	51	....	5	13
	Average.	84.13	12.21	2.72	.94	.....	31	.164	.....	55	....	51	46	....	9.4	22

[1] The letters in this column stand for small, medium, and large. Granules the size of a grain of wheat and less are called "small"; those as large as a pea or bean are called "medium"; and when larger than a hean they are called "large."

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